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WILL. MORRICE.

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Michael Newton

THE HISTORY OF THE Royal-Society OF LONDON,

For the Improving of

NATURAL KNOWLEDGE.

BY

THO. SPRAT.

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LONDON,

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TO THE.

KING.

SIR,

OF *all the Kings of* Europe, *Your Majeſty was the firſt, who confirm'd this Noble Deſign of* Experiments, *by Your own Example, and by a Public Eſtabliſhment. An* Enterprize *equal to the*

the moſt renoun'd Actions of the beſt Princes. *For, to increaſe the Powers of all Mankind, and to free them from the bondage of Errors, is greater Glory than to enlarge* Empire, *or to put Chains on the necks of Conquer'd* Nations.

What Reverence all Antiquity *had for the* Authors *of* Natural Diſcoveries, *is evident by the Diviner ſort of Honor they conferr'd on them. Their Founders of* Philoſophical Opinions *were only admir'd by their own* Sects. *Their* Valiant Men *and* Generals *did ſeldome riſe higher than to* Demy-Gods *and* Heros. *But the* Gods *they Worſhipp'd with* Temples *and* Altars, *were thoſe who inſtructed the World to* Plow, *to* Sow, *to* Plant, *to* Spin, *to* build Houſes, *and to find out* New Countries. *This Zeal indeed, by which they expreſs'd their Gratitude*

to

to ſuch Benefactors, degenerated into Superſtition: yet has it taught us, That a higher degree of Reputation is due to Diſcoverers, *than to the* Teachers *of* Speculative Doctrines, *nay even to* Conquerors *themſelves.*

Nor has the True God *himſelf omitted to ſhew his value of* Vulgar Arts. *In the whole* Hiſtory *of the firſt* Monarchs *of the World, from* Adam *to* Noah, *there is no mention of their* Wars, *or their* Victories: *All that is Recorded is this, They liv'd ſo many years, and taught their* Poſterity *to keep* Sheep, *to till the* Ground, *to plant* Vineyards, *to dwell in* Tents, *to build* Cities, *to play on the* Harp *and* Organs, *and to work in* Braſs *and* Iron. *And if they deſerv'd a* Sacred Remembrance, *for one* Natural *or* Mechanical Invention,

Your

The Epiſtle Dedicatory.

Your Majeſty *will certainly obtain* Immortal Fame, *for having eſtabliſh'd a perpetual Succeſſion of* Inventors.

I am

(*May it pleaſe Your Majeſty*)

Your Majeſties moſt humble,
and moſt obedient

Subject, and *Servant*,

THO. SPRAT.

To the *Royal Society.*

I.

PHILOSOPHY the great and only Heir
Of all that Human Knowledge which has bin
Unforfeited by Mans rebellious Sin,
Though full of years He do appear,
(Philoſophy, I ſay, and call it, He,
For whatſoe're the Painters Fancy be,
It a Male Virtu ſeems to me)
Has ſtill bin kept in Nonage till of late,
Nor manag'd or enjoy'd his vaſt Eſtate:
Three or four thouſand years one would have thought,
To ripeneſs and perfection might have brought
A Science ſo well bred and nurſt,
And of ſuch hopeful parts too at the firſt.
But, oh, the Guardians and the Tutors then,
(Some negligent, and ſome ambitious men)
Would ne're conſent to ſet him Free,
Or his own Natural Powers to let him ſee,
Leſt that ſhould put an end to their Autoritie.

II.

That his own buſineſs he might quite forgit,
They' amus'd him with the ſports of wanton Wit,
With the Deſſerts of Poetry they fed him,
Inſtead of ſolid meats t' encreaſe his force;
Inſtead of vigorous exerciſe, they led him
Into the pleaſant Labyrinths of ever-freſh Diſcours:
Inſtead of carrying him to ſee
The Riches which doe hoorded for him lye

In Natures endleſs Treaſurie,
They choſe his Eye to entertain
(His curious but not covetous Eye)
With painted Scenes, and Pageants of the Brain.
Some few exalted Spirits this latter Age has ſhown,
That labour'd to aſſert the Liberty
(From Guardians, who were now Uſurpers grown)
Of this Old Minor *ſtill, Captiv'd Philoſophy;*
But 'twas Rebellion call'd to fight
For ſuch a long oppreſſed Right.
Bacon *at laſt, a mighty Man, aroſe,*
Whom a wiſe King and Nature *choſe*
Lord Chancellour of both their Laws,
And boldly undertook the injur'd Pupils caus.

III.

Autority, which did a Body boaſt,
Though 'twas but Air condens'd, and ſtalk'd about,
Like ſome old Giants more Gigantic Ghoſt,
To terrifie the Learned Rout
With the plain Magique of tru Reaſons Light,
He chac'd out of our ſight,
Nor ſuffer'd Living Men to be miſled
By the vain ſhadows of the Dead: (*fled;*
To Graves, from whence it roſe, the conquer'd Phantome
He broke that Monſtrous God which ſtood
In midſt of th' Orchard, and the whole did claim,
Which with a uſeleſs Sith of Wood,
And ſomething elſe not worth a name,
(Both vaſt for ſhew, yet neither fit
Or to Defend, or to Beget;
Ridiculous and ſenceleſs Terrors!) made
Children and ſuperſtitious Men afraid.
The Orchard's open now, and free;
Bacon *has broke that Scar-crow Deitie;*

Come

Come, enter, all that will,
Behold the rip'ned Fruit, come gather now your Fill.
Yet ſtill, methinks, we fain would be
Catching at the Forbidden Tree,
We would be like the Deitie,
When Truth and Falſhood, Good and Evil, we
Without the Sences aid within our ſelves would ſee;
For 'tis God only who can find
All Nature in his Mind.

IV.

From Words, which are but Pictures of the Thought,
(Though we our Thoughts from them perverſly drew)
To Things, the Minds right Object, he it brought,
Like fooliſh Birds to painted Grapes we flew;
He ſought and gather'd for our uſe the Tru;
And when on heaps the choſen Bunches lay,
He preſt them wiſely the Mechanic way,
Till all their juyce did in one Veſſel joyn,
Ferment into a Nouriſhment Divine,
The thirſty Souls refreſhing Wine.
Who to the life an exact Piece would make,
Muſt not from others Work a Copy take;
No, not from Rubens *or* Vandike;
Much leſs content himſelf to make it like
Th' Idæas and the Images which ly
In his own Fancy, or his Memory.
No, he before his ſight muſt place
The Natural and Living Face;
The real Object muſt command
Each Judgment of his Eye, and Motion of his Hand.

V.

From theſe and all long Errors of the way,
In which our wandring Prædeceſſors went,
And like th'old Hebrews *many years did ſtray.*

In Deſarts but of ſmall extent,
Bacon, *like* Moſes, *led us forth at laſt,*
The barren Wilderneſs he paſt,
Did on the very Border ſtand
Of the bleſt promis'd Land,
And from the Mountains Top of his Exalted Wit,
Saw it himſelf, and ſhew'd us it.
But Life did never to one Man allow
Time to Diſcover Worlds, and Conquer too;
Nor can ſo ſhort a Line ſufficient be
To ſadome the vaſt depths of Natures Sea:
The work he did we ought t' admire,
And were unjuſt if we ſhould more require
From his few years, divided 'twixt th' Exceſs
Of low Affliction, and high Happineſs:
For who on things remote can fix his ſight,
That's always in a Triumph, or a Fight?

VI.

From you, great Champions, we expect to get
Theſe ſpacious Countries but diſcover'd yet;
Countries where yet inſtead of Nature, we
Her Images and Idols worſhip'd ſee:
Theſe large and wealthy Regions to ſubdu,
Though Learning has whole Armies at command,
Quarter'd about in every Land,
A better Troop ſhe ne're together drew.
Methinks, like Gideon's *little Band,*
God with Deſign has pickt out you,
To do theſe noble Wonders by a Few:
When the whole Hoſt he ſaw, They are (ſaid he)
Too many to O'recome for Me;
And now he chuſes out his Men,
Much in the way that he did then:
Not thoſe many whom he found

Idely

Idely extended on the ground,
To drink with their dejected head
The Stream juſt ſo as by their Mouths it fled:
No, but thoſe Few who took the Waters up,
And made of their laborious Hands the Cup.

VII.

Thus you prepar'd; and in the glorious Fight
Their wondrous pattern too you take:
Their old and empty Pitchers firſt they brake,
And with their Hands then lifted up the Light.
Io! Sound too the Trumpets here!
Already your victorious Lights appear;
New Scenes of Heven already we eſpy,
And Crowds of golden Worlds on high;
Which from the ſpacious Plains of Earth and Sea,
Could never yet diſcover'd be.
By Sailers or Chaldæans *watchful Eye.*
Natures great Works no diſtance can obſcure,
No ſmalneſs her near Objects can ſecure.
Y' have taught the curious Sight to preſs
Into the privateſt receſs
Of her impereceptible Littleneſs.
She with much ſtranger Art than his who put
All th' Iliads in a Nut,
The numerous work of Life does into Atomes ſhut.
Y' have learn'd to Read her ſmalleſt Hand,
And well begun her deepeſt Senſe to Underſtand.

VIII.

Miſchief and ſhame Diſhonour fall on thoſe
Who would to laughter or to ſcorn expoſe
So Virtuous and ſo Noble a Deſign,
So Human for its Uſe, for Knowledge ſo Divine.
The things which theſe proud men deſpiſe, and call
Impertinent, and vain, and ſmall,

Thoſe

Thoſe ſmalleſt things of Nature let me know,
Rather than all their greateſt Actions Doe.
Whoever would Depoſed Truth advance
Into the Throne uſurp'd from it,
Muſt feel at firſt the Blows of Ignorance,
And the ſharp Points of Envious Wit.
So when by various turns of the Celeſtial Dance,
In many thouſand years
A Star, ſo long unknown, appears,
Though Heven it ſelf more beauteous by it grow,
It troubles and alarms the World below,
Does to the Wiſe a Star, to Fools a Meteor ſhow.

IX.

With Courage and Succeſs you the bold work begin
Your Cradle has not Idle bin:
None e're but Hercules *and you could be*
At five years Age worthy a Hiſtory.
And ne're did Fortune better yet
Th' Hiſtorian to the Story fit:
As you from all Old Errors free
And purge the Body of Philoſophy;
So from all Modern Folies He
Has vindicated Eloquence and Wit.
His candid Stile like a clean Stream does ſlide,
And his bright Fancy all the way
Does like the Sun-ſhine in it play;
It does like Thames, *the beſt of Rivers, glide,*
Where the God does not rudely overturn,
But gently pour the Cryſtal Urn,
And with judicious hand does the whole Current guide.
T' has all the Beauties Nature can impart,
And all the comely Dreſs without the paint of Art.

A. COWLEY.

AN Advertiſement to the Reader.

THE Reader is intreated to take notice, That much of this Diſcourſ was Written and Printed above two years before the reſt: For this cauſe, in the Firſt and Second Books, he may chance to find ſome Expreſſions that by reaſon of the difference of time may ſeem not well to agree with the laſt: But thoſe having paſs'd the Preſs ſo long ago, were out of my power of changing them; and therefore I will refer it to his kindneſs, to do it for me.

I muſt alſo acquaint him, That in the Title of my Book I have taken a liberty, which may be liable to exception: I have call'd it a Hiſtory of the Royal Society; *whereas the Firſt Part wholly Treats of the ſtate of the* Ancient Philoſophy; *and the Third chiefly contains a Defence and Recommendation of* Experimental Knowledge *in General:*

General: So that it is only the Second Book that peculiarly deſcribes their Undertaking. But for my excuſe I may allege the Example of many of the Ancients, *who have often from the Principal Part of their Works given Title to all the reſt: In their imitation, though this Book does Treat of many Subjects that are not Hiſtorical, yet I have preſum'd to name the whole a* Hiſtory, *becauſe that was the main end of my Deſign*

The Style perhaps in which it is written, is larger and more contentious than becomes that purity and ſhortneſs which are the chief beauties of Hiſtorical Writings: But the blame of this ought not ſo much to be laid upon me, as upon the Detractors of ſo noble an Inſtitution: For their Objections and Cavils againſt it, did make it neceſſary for me to write of it, not altogether in the way of a plain Hiſtory, *but ſomtimes of an* Apology.

THE

THE HISTORY OF THE *Inſtitution, Deſign,* and *Progreſs,* OF THE *ROYAL SOCIETY* OF LONDON.

For the Advancement of Experimental Philoſophy.

The FIRST PART.

Shall here preſent to the World, an Account of the *Firſt Inſtitution* of the *Royal Society*; and of the *Progreſs*, which they have already made: in hope, that this Learned and Inquiſitive Age, will either think their Indeavours, worthy of its *Aſſiſtance*; or elſe will be thereby provok'd, to attempt ſome *greater Enterpriſe* (if any ſuch can be found out)

Section I. *The Preface, and Deſign of this Diſcourſe.*

out) for the Benefit of humane life, by the Advancement of *Real Knowledge.*

Perhaps this Taſk, which I have propos'd to my ſelf, will incurr the Cenſure of many Judicious Men, who may think it an over-haſty, and preſumptuous Attempt: and may object to me, that the *Hiſtory* of an Aſſembly which begins with ſo great expectations, ought not to have been made publique ſo ſoon; till We could have produced very many conſiderable *Experiments*, which they had try'd, and ſo have given undenyable *Proofs*, of the uſefulneſs of their undertaking.

In anſwer to this, I can plead for my ſelf, that what I am here to ſay, will be far from preventing the labours of others in adorning ſo worthy a Subject: and is *premis'd* upon no other account, then as the nobleſt Buidings are firſt wont to be repreſented in a few *Shadows*, or ſmall *Models*: which are not intended to be equal to the Chief Structure it ſelf, but onely to ſhew in little, by what *Materials*, with what *Charge*, and by how *many Hands*, that is afterwards to be rais'd. Although therefore, I come to the performance of this work, with much leſs *deliberation*, and *ability*, then the *weightineſs* of it requires: yet, I truſt, that the *Greatneſs* of the *Deſign* it ſelf, on which I am to ſpeak, and the *zeal* which I have for the *Honour* of our *Nation*, which have been the chief reaſons, that have mov'd me to this confidence of writing, will ſerve to make ſomething for my *Excuſe*. For what greater matter can any man deſire, about which to employ his thoughts, then the Beginnings of an *Illuſtrious Company*, which has already laid ſuch excellent Foundations of ſo much good to *Mankind*?

Or,

Or, what can be more delightful for an *Engliſhman* to conſider, then that notwithſtandng all the late miſeries of his Country; it has been able in a ſhort time ſo well to recover it ſelf: as not onely to attain to the perfection of its *former* Civility, and Learning, but alſo to ſet on foot, a *new* way of improvement of Arts, as *Great* and as *Beneficial* (to ſay no more) as any the wittieſt or the happieſt Age has ever invented?

But beſides this, I can alſo add, inmy Defence, that though the *Society*, of which I am to write, is not yet four years old, and has been of neceſſity hitherto chiefly taken up, about *Preparatory Affairs:* yet even in this time, they have not wholly neglected their *principal End*; but have had Succeſs, in the tryal of many remarkable things; of which I doubt not, but I ſhall be able, as I paſs along, to give inſtances enough to ſatisfie the curioſity of all *ſober Inquirers* into Truth. And in ſhort, if for no other end, yet certainly for this, A Relation of their Firſt Original ought to be expos'd to the view of Men: that by laying down, on what courſe of Diſcovery they intend to proceed, the *Gentlemen of the Society*, may be more ſolemnly engag'd, to *proſecute* the ſame. For now they will not be able, handſomely to draw back, and to forſake ſuch honourable Intentions: when the World ſhall have taken notice, that ſo many prudent men have gone ſo farr, in a buſineſs of this Univerſal Importance, and have given ſuch undoubted *Pledges*, of many admirable Inventions to follow.

Sect. II. *The Diviſion of the Diſcourſe.*

I ſhall therefore divide my Diſcourſe into theſe three general Heads.

The *Firſt* ſhall give a ſhort view of the *Antient*, and *Modern* Philoſophy; and of the moſt Famous Attempts, that have been made for its *Advancement:* that by obſerving wherein others have *excell'd*, and wherein they have been thought to *fail*, we may the better ſhew, what is to be expected, from theſe new Undertakers; and what mov'd them, to enter upon a way of Inquiry, different from that, on which the former have proceeded.

The *Second* ſhall conſiſt of the *Narrative* it ſelf: and out of their *Regiſters*, and *Journals*, which I have been permitted to peruſe, ſhall relate the firſt Occaſions of their Meetings, the Incouragement, and Patronage, which they have receiv'd; their *Patent*, their *Statutes*, the whole Order and Scheme of their *Deſign*, and the *Manner* of their Proceedings.

The *Third* ſhall try, to aſſert the *Advantage* and *Innocence* of this work, in reſpect of all *Profeſſions*, and eſpecially of *Religion*; and how proper, above others, it is, for the preſent temper of the *Age* wherein we live.

On the *Firſt* and *Laſt* of theſe Particulars, it is not needfull that I ſhould long inſiſt: becauſe ſeveral *Great Men* have already ſo much prevented me about them; that there is hardly any thing can be ſpoken, in which I ſhall not almoſt tread in their very *Footſteps*. But yet it is requiſite, that ſomething be here ſaid to that purpoſe, though it be onely in *Repetition:* becauſe I perceive, that there is ſtill much prejudice remaining on many mens minds, towards any *now* Diſcoveries in *Natura* Things. This I ſhall try to remove, not that I imagine, that thoſe Reaſons can have any great effect

fect in my *weak hands*, which were not able fully to prevail, when they were inforc'd by the Eloquence of thoſe *Excellent Men*, who have gone before me in this Argument: But I rather truſt to the inclination of the *Age* it ſelf, wherein I write; which (if I miſtake not) is farr more prepar'd to be perſwaded to promote ſuch Studies, then any other time that has gone before us.

Sect. III. *The Philoſophy of the Eaſt.*

And firſt, let us obſerve the Practice of the beſt, and the civileſt Nations, amongſt the *Antients*; and a little trace out the courſe which they followed, to inrich their Countries, by the introducing of *Forein* Arts, or a ſearching into *New*.

It is evident, from the univerſal Teſtimony of *Hiſtory*, that all Learning and Civility were deriv'd down to us, from the *Eaſtern* parts of the World. There it was, that Mankind aroſe: and there they firſt diſcovered the wayes of living, with ſafety, convenience, and delight. It is but juſt, that we ſhould attribute the original of *Aſtronomy*, *Geometry*, *Government*, and many ſorts of Manufactures, which we now enjoy, to the *Aſſyrians*, the *Chaldeans*, and *Egyptians*. And as to them we owe the *Invention*; ſo from them proceeded the firſt *Corruption* of knowledge. It was the cuſtom of their Wiſe men, to wrap up their Obſervations on Nature, and the Manners of Men, in the dark Shadows of *Hieroglyphicks*; and to conceal them, as ſacred *Myſteries*, from the apprehenſions of the vulgar. This was a ſure way to beget a Reverence in the Peoples Hearts towards *themſelves*: but not to advance the true Philoſophy of *Nature*. That ſtands not in need of ſuch Artifices to uphold its credit: but is then moſt likely to

to thrive, when the minds, and labours of men of all Conditions, are join'd to promote it, and when it becomes the care of united Nations.

Into the *East*, the first Inquisitive Men amongst the *Grecians* travelled: By what they observed there, they ripened their own imperfect Conceptions, and so return'd to teach them at home. And that they might the better insinuate their opinions into their hearers minds, they set them off with the mixture of *Fables*, and the ornaments of *Fancy*. Hence it came to pass, that the first Masters of knowledge amongst them, were as well *Poets*, as *Philosophers*: For *Orpheus*, *Linus*, *Musæus*, and *Homer*, first softned mens natural rudeness, and by the charms of their Numbers, allur'd them to be instructed by the severer Doctrines, of *Solon*, *Thales*, and *Pythagoras*. This was a course, that was useful at first, when men were to be delightfully deceiv'd to their own good: But perhaps it left some ill influence, on the whole Philosophy of their Successors; and gave the *Grecians* occasion ever after of exercising their wit, and their imagination, about the works of Nature, more then was consistent with a sincere Inquiry into them.

Sect. IV. *The Philosophy of Greece.*

When the fabulous Age was past: *Philosophy* took a little more courage; and ventured more to relye upon its own strength, without the Assistance of *Poetry*. Now they began to gather into Assemblies, and to increase their interest: and, according to the different temper of the *Grecians*, from the *Eastern* Nations; so were their Arts propagated in a different way from theirs. The *Greeks*, being of a vigorous, and active humour, establish't their Philosophy,

ſophy, in the *Walks*, and *Porches*, and *Gardens*, and ſuch publick places about their Cities: whereas the Graver, and more reſerv'd *Ægyptians*, had confin'd it to their *Temples*.

In *Greece*, the moſt conſiderable (and indeed almoſt the onely ſucceſsful) Tryals, that were made in this way, were at *Athens*. The wit of whoſe Inhabitants, was ('tis true) admirably fit, for the reducing of Philoſophy into *Method*, and for the adorning of it with the nobleſt words; when once it had been before compleated in its ſubſtance: But yet their Genius was not ſo well made, for the undergoing of the firſt *drudgery* and *burden* of *Obſervation*, which is needful for the *Beginning* of ſo difficult a work. This will appear, if we remember, that they were the Maſters of the Arts of *Speaking*, to all their Neighbours: and ſo might well be inclin'd, rather to chooſe ſuch opinions of Nature, which they might moſt elegantly expreſs; then ſuch, which were more uſeful, but could not ſo well be illuſtrated by the ornaments of Speech. Beſides this, their *City* was the General *Schole*, and Seat of *Education*: and therefore the Epitome's of knowledge beſt ſerved their turn, to make their Scholars, in a ſhort time, finiſh the courſe of their Studies, and go home ſatisfied with a belief of their own Proficience, and their Teachers Wiſdom. They were alſo commonly (as moſt of the other *Grecians*) men of hot, earneſt, and haſty minds: and ſo lov'd rather to make *ſudden* Concluſions, and to convince their hearers by argument; then to *delay* long, before they fixt their judgments; or to attend with ſufficient patience the labour of Experiments. But to ſay no more, they had but a *narrow Territory*; and the conditi-

on

on of thoſe times, would not allow a very large commeree, with forein Nations: they were much exercis'd in the civil Affairs of their Country: they had almoſt a perpetual Warr, at home, or abroad: which kinds of buſie, and active life, breed men up indeed for great Employments: but not ſo well for the diligent, private, and ſevere examination of thoſe little and almoſt infinite Curioſities, on which the true Philoſophy muſt be founded.

Sect. V. *The Original of the Philoſophical Sects.*

In that City therefore, the knowledge of *Nature* had its Original, before either that of *Diſcourſe*, or of *humane Actions:* but it was quickly forc'd to give way to them Both. For it was not yet come to a ſufficient ripeneſs, in the time of *Socrates*. And he, by the authority of his admirable wit, made all parts of Philoſophy to be taken off from a condition of encreaſing much farther, that they might be immediat ely ſerviceable to the affairs of men, and the uſes of life. He was one of the firſt men, that began to draw into ſome order, the confus'd, and obſcure imaginations, of thoſe that went before him: and to make way for the compoſing of Arts, out of their ſcattered Obſervations. All theſe various Subjects, the vaſtneſs of his Soul comprehended in his *caſual Diſputations:* but after his death they were divided amongſt his Followers, according to their ſeveral inclinations. From him moſt of the ſucceeding *Sects* deſcended: and though every one of them had its different principles, and rendezvouſes: yet they all laid claim to this one common title of being *his Diſciples*. By this means, there was a moſt ſpecious appearance of the increaſe of Learning: all places were fill'd with Philoſophical Diſ-

diſputes: controverſies were rais'd: Factions were made: many ſubtilties of confuting, and defending, were invented: but ſo inſteed of joyning all their ſtrength to overcome the ſecrets of Nature (all which would have been little enough, though never ſo wiſely manag'd) they onely did that, which has undone many ſuch great attempts, before they had yet fully conquer'd her; they fell into an open diſſenſion, to which of them, her ſpoyls did belong.

'Tis true, at the ſame time, ſome few men did continue an earneſt, and laborious purſuit, after *Natural cauſes, and effects*: and took that courſe, which, if it, had met with as much incouragement, as the others had, would without queſtion have produc'd extraordinary things. But theſe Philoſophers, digging deap, out of the ſight of men; and ſtudying more, how to *conceive* things *aright*, then how to *ſet off*, and perſuade their conceptions, to others; were quickly almoſt quite overwhelm'd, by the more plauſible and Talkative Sects.

Sect. VI. *The Philoſophy amongſt the Romans.*

This was the ſucceſs of that Famous Age of the *Grecian* Learning, in reſpect of Natural knowledge. They ſtay'd not for an information ſufficient for ſuch a noble Enterpriſe: They would not ſuffer their poſterity, to have any ſhare with them, in the honor of performing it: But too ſuddenly, for preſent uſe, they clap'd up an entire Building of Sciences: and therefore it is not to be wonder'd, if the *haſty Fabrick*, which they rais'd, did not conſiſt of the beſt materialls.

But at laſt with their Empire, their Arts alſo were tranſported to *Rome*: the great ſpirit of their Law-

givers, and Philoſophers, in courſe of time, degenerating into Rhetoricians, and wandring Teachers of the opinions, of their private Sects. Amongſt the Romans, the ſtudies of Nature met with little, or no entertainment. They ſcarce ever dream't of any other way of Philoſophy, then only juſt reducing into New Method, and eloquently tranſlating into their own Language, the Doctrines, which they had receiv'd from the Greeks. And it was a long time too, before even that could obtain any countenance amongſt them. For, in the firſt warlick and buſie Ages of that State, they onely apply'd themſelves to a ſeverity of Moral vertue; indeavor'd after no other skill, then that of the Cuſtomes, and Laws of their Country, the Ceremonies of their Religion, and the Arts of Government: eſteeming every thing that came out of Greece, as an outlandiſh faſhion, which would corrupt the manners of their Youth; and allure them, from that ſtrictneſs of Diſcipline, and Integrity of Life, by which they had inlarg'd the Bounds of their Common-wealth. Till at length their power being increas'd, and their minds a little ſoftned by the Greatneſs of their commands, and having taſted of the pleaſures of the Eaſt; they were content too, by degrees, to admit their Philoſophy. And yet all the uſe, that they made of it at laſt, was onely, either that they might thereby make their ſpeech more plentiful; or elſe, that when they were at leiſure from Civil affairs, they might have that as a companion, and comfort of their Retirements.

Sect. VII. *The Philoſophy of the Primitive Church.*

This was the condition of Philoſophy, when the Chriſtian Religion came into the World. That maintain'd

tain'd it ſelf in its firſt Age, by the innocence, and miracles, and ſuff'rings of its Founder, and his Apoſtles. But after their Deaths, when Chriſtianity began to ſpread into the fartheſt Nations, and when the power of working wonders had ceas'd: it was thought neceſſary, for its increaſe, that its profeſſors ſhould be able to defend it, againſt the ſubtilties of the Hethens; by thoſe ſame ways of arguing, which were then in uſe, among the Hethen Philoſophers. It was therefore on this account, that the Fathers, and chief Doctors of our Church, apply'd themſelves to the Peripatetick, and Platonick Sects: But chiefly to the Platonick: Becauſe that ſeem'd to ſpeak plainer about the Divine Nature; and alſo, becauſe the ſweetneſs, and powerfulneſs of *Plato's* Writings, did ſerve as well to make them popular ſpeakers, as diſputers. Having thus provided themſelves againſt their adverſaries, they eaſily got the victory over them: and though the Idolatrous Gentiles had kept the inſtruments of diſputing, in their own hands, ſo many hundred years; yet they ſoon convinc'd them, of the ridiculouſneſs of their worſhips, and the purity, and reaſonableneſs of ours.

But now the Chriſtians having had ſo good ſucceſs, againſt the Religions of the Heathens, by their own weapons; inſtead of laying them down when they had done, unfortunately fell to manage them one againſt another. So many ſubtile brains having been ſet on work, and warm'd againſt a Forein enemy: When that was over, and they had nothing elſe to do (like an Army that returns victorious, and is not preſently disbanded) they began to ſpoyl, and quarrel amongſt themſelves. Hence that Religion, which at firſt appear'd ſo innocent, and peaceable,

and fitted for the benefit of humane Society; which conſiſted in the plain, and direct Rules, of good Life, and Charity, and the Belief in a redemption by one Savior, was miſerably divided into a thouſand intricate queſtions, which neither advance true Piety, nor good manners. Hence aroſe all the Hereſies of thoſe times Againſt theſe, beſides the force of Diſputation, the Church obtain'd the Arm of the Civil Magiſtrate: and ſo at laſt by the help of many General Councils, got them extinguiſh'd, (if I may ſay they were extinguiſh'd, ſeeing in this age wherein we live, we have ſeen moſt of them unhappily reviv'd.) But ſtill by this means there was no knowledge in requeſt, but the Diſputative Philoſophy. For while things were in this poſture, and ſo many great Wits ingag'd in the heats of controverſie: it was not to be expected, that they ſhould look out for further aſſiſtance, then the Arts, which were already prepar'd; or that they ſhould make any conſiderable indeavors, about new inventions, and the tedious tryal of Experiments. Nor can we much blame them for it: ſeeing in a time of War, every man will rather ſnatch up that armor which he finds ready made, then ſtay till men go to the Mine, and digge out new Ore, and refine, and harden it a better way; in hope to have his weapons of a ſtronſter, and nobler Metal at laſt.

Nor was that Age unfit for ſuch an enterpriſe, only on the account of theſe Warrs of the Tongue: But alſo by reaſon of the miſerable diſtempers of the civill affairs of the World, about that time: which were chiefly occaſion'd by the Roman Armies uſurping the Right of chooſing Emperors, and by the invaſions of Barbarous Nations, which overwhelm'd the greateſt part of *Europe*. Amidſt theſe diſtractions,

it

it was impoſſible for any thing of this Nature to have proſper'd: and in ſo vaſt an inundation of ignorance, which carri'd away with it the very grown and aged Trees themſelves (thoſe parts of Learning which had taken root, ſo many generations paſt) it would have been in vain, to have committed any new plants to the ground. Such ſtudies as theſe, as they muſt receive incouragement from the Sovereign Authority, ſo they muſt come up in a peacefull time, when mens minds are at eaſe, and their imaginations not diſturb'd, with the cares of preſerving their Lives, and Fortunes.

Sect. VIII. *The Philoſophy under the Church of* Rome.

To go on therefore with the matter of Fact: Having left that diſmall Bloody Age, we come into a Courſe of Time, which was indeed farr quieter: But it was like the quiet of the night, which is dark withall. The Biſhops of *Rome* taking the opportunity of the decay of the Roman Empire, had wreſted from it ſo many privileges, as did at laſt wholly deſtroy it: and while it was gaſping for life, forc'd it to make what Will, and Teſtament they pleas'd. Being thus eſtabliſh'd, and making *Rome*, whoſe name was ſtill venerable, the Seat of their Dominion, they ſoon obtain'd a Supremacy over the Weſtern World. Under them for a long ſpace together men lay in a profound ſleep. Of the Univerſal ignorance of thoſe times; let it ſuffice to take the Teſtimony of *William* of *Malmsbury*, one of our antient Engliſh Hiſtorians, who ſays, That even amongſt the Prieſts themſelves, he was a Miracle that could underſtand Latine. Thus they continued; till at laſt, that Church adopted, and cheriſh'd, ſome of the Peripatetick opinions, which the moſt ingenious of the Moneks,

Moncks, in their ſolitary, and idle courſe of life, had lighted upon. This Sect was excellently well made for their turn. For by hovering ſo much, in geneall Terms, and Notions, it amusd mens minds, in things that had not much difficulty: and ſo the Laity being kept blind, were forc'd in all things to depend on the Lips of the *Roman Clergy*. From that time, even down to the *Reformation*, the *Gentlemen* of all theſe Countries, imploying themſelves, chiefly in arms, and adventures abroad: and the Books of the *antients*, being either deſtroy'd by the *Goths*, and *Vandalls*; or thoſe which eſcap'd their fury, lying cover'd with duſt in the Libraries of *Monaſteries*: few or none regarded any of the Arts of Wit, and Reaſon, beſides the *Church-men*.

This, I will take the boldneſs to ſay, muſt needs be very injurious to the increaſe of *Generall Learning*. For though I ſhall juſtly affirm, to the honor of that *ſacred profeſſion*, that all knowledge has been more ſearch'd into, and promoted by *them*, then by any other *order* of men, even from the *Egyptians* times, (whoſe *Prieſts* in good part invented, or at leaſt preſerv'd, the Learning of the *Eaſt*) down to our preſent Age: yet I muſt alſo adde, that whenever all the ſtudious ſpirits of a Nation, have been reduc'd within the Temples walls, that time is naturally lyable to this danger, of having its Genius more intent, on the different opinions in *Religion*, and the Rites of Worſhip, then on the increaſe of any other *Science*. Of this I ſhall give two inſtances: one, from the *Antients*: the other, from *our ſelves*.

It is manifeſt, that amongſt the *Jews*, all the men of Letters ſtill appli'd themſelves to the underſtanding of their *Law*: that being the publick way

of

of preferment, to the higheſt places of Judicature and Authority in the State. For that many Fraternities were erected, and (as I may call them) *Judaical Monaſt'ries* conſtituted. Hence came all the interpretations on the Writings of their *Great Lawgiver*: which at laſt grew ſo numerous, and various amongſt themſelves, that *Chriſt*, when he came, could hardly find any thing of *Moſes his mind*, in all they had writ: But perform'd more himſelf towards the explanation of the *Law*, in *two Chapters*, then they had done in all their infinite Volumes. But while they were ſo exceſſively buſie, about ſuch ſorts of contemplations, the other parts of Learning were neglected: Little or no footſteps of Philoſophy remaining amonſt them, except onely the memory of that *Hiſtory of Plants*, which was not written by any of *Aaron's* family, but by their *wiſeſt King*.

Sect. IX. *The Philoſophy of the Schole-men.*

But my other inſtance comes neerer home, and *it is* of the *Schole-men*. Whoſe works when I conſider, it puts into my thoughts, how farre more importantly a good Method of thinking, and a right courſe of apprehending things, does contribute towards the attaining of perfection in true knowledge, then the ſtrongeſt, and moſt vigorous wit in the World, can do without them. It cannot without injuſtice be deny'd, that they were men of extraordinary ſtrength of mind: they had a great quickneſs of imagination, and ſubtilty of diſtinguiſhing: they very well underſtood the conſequence of propoſitions: their natural endowments were excellent: their induſtry commendable: But they lighted on a wrong path at firſt, and wanted matter to contrive: and ſo, like the *Indians*, onely expreſs'd a wonderful Artifice,

Artifice, in the ordering of the ſame Feathers into a thouſand varities of Figures. I will not inſiſt long on the Barbarouſneſs of their ſtyle: though that too might juſtly be cenſur'd: for all the *antient Philoſophers*, though they labor'd not to be full, and adorn'd in their Speech: yet they always ſtrove to be eaſie, naturall, and unaffected. *Plato* was allow'd by all to be the chief Maſter of *ſpeaking*, as well as of *thinking*. And even *Ariſtotle* himſelf, whom alone theſe men ador'd, however he has been ſince uſ'd by his *Commentators*, was ſo carefull about his words, that he was eſteem'd one of the pureſt, and moſt polite Writers of his time. But the want of good Language, not being the *Schole-mens* worſt defect, I ſhall paſs it over: and rather ſtop a little, to examine the the *matter* itſelf, and *order* in which they proceeded.

The *Subjects* about which they were moſt converſant, were either ſome of thoſe *Arts*, which *Ariſtoſtle* had drawn into Method, or the more ſpeculative parts of our *Divinity*. Theſe they commonly handled after this faſhion. They began with ſome generall Definitions of the things themſelves, according to their univerſal Natures: Then divided them into their parts, and drew them out into ſeverall propoſitions, which they layd down as Problems: theſe they controverted on both ſides: and by many nicities of Arguments, and citations of Authorities, confuted their adverſaries, and ſtrengthned their own dictates. But though this Notional Warr had been carry'd on with farr more care, and calmneſs amongſt them, then it was: yet it was never able to do any great good towards the enlargement of knowledge: Becauſe it rely'd on *generall Terms*, which

which had not much foundation in *Nature*; and alſo becauſe they took no other courſe, but that of *diſputing*.

That this inſiſting altogether on eſtabliſh'd *Axioms*, is not the moſt uſefull way, is not only cleer in ſuch airy conceptions, which they manag'd: but alſo in thoſe things, which lye before every mans obſervation, which belong to the life, and paſſions, and manners of men; which, one would think, might be ſooner reduc'd into ſtanding Rules. As for example: To make a prudent man in the affairs of State, It is not enough, to be well vers'd in all the concluſions, which all the *Politicians* in the World have devis'd, or to be expert in the Nature of Government, and Laws, Obedience, and Rebellion, Peace, and War: Nay rather a man that relyes altogether on ſuch univerſal precepts, is almoſt certain to miſcarry. But there muſt be a ſagacity of judgement in particular things: a dexterity in diſcerning the advantages of occaſions: a ſtudy of the humour, and intereſt of the people he is to govern: The ſame is to be found in *Philoſophy*; a thouſand fine Argumentations, and Fabricks in the mind, concerning the Nature of *Body*, *Quantity*, *Motion*, and the like, if they only hover a-loof, and are not ſquar'd to particular matters, they may give an empty ſatisfaction, but no benefit, and rather ſerve to *ſwell*, then *fill* the Soul.

But beſides this, the very way of *diſputing* itſelf, and inferring one thing from another alone, is not at all proper for the ſpreading of knowledge. It ſerves admirably well indeed, in thoſe Arts, where the connexion between the propoſitions is neceſſary, as in the *Mathematicks*; in which a long train of *Demonſtrations*, may be truly collected, from the certainty of the firſt foundation: But in things of probability onely,

it ſeldom or never happens, that after ſome little progreſs, the main ſubject is not left, and the contenders fall not into other matters, that are nothing to the purpoſe: For if but one link in the whole chain be looſe, they wander farr away, and ſeldom, or never recover their firſt ground again. In brief, *diſputing* is a very good inſtrument, to ſharpen mens wits, and to make them verſatil, and wary defenders of the Principles, which they already know: but it can never much augment the *ſolid ſubſtance* of *Science* itſelf: And me thinks compar'd to *Experimenting*, it is like *Exerciſe* to the Body in compariſon of *Meat*: For running, walking, wreſtling, ſhooting, and other ſuch active ſports, will keep men in health, and breath, and a vigorous temper: but it muſt be a ſupply of new food that muſt make them grow: ſo it is in this caſe; much contention, and ſtrife of argument, will ſerve well to explain obſcure things, and ſtrengthen the weak, and give a good, ſound, maſculine colour, to the whole maſſe of knowledge: But it muſt be a continued addition of obſervations, which muſt nouriſh, and increaſe, and give new Blood, and fleſh, to the *Arts* themſelves.

But this has been only hitherto ſpoken, againſt the *Method* of the *Schole-men* in General; on ſuppoſition, that they took the beſt courſe, that could be in that kind. I ſhall now come, to weigh that too. For it may eaſily be prov'd, that thoſe very Theories, on which they built all their ſubtle webs, were not at all Collected, by a ſufficient information from the things themſelves. Which if it can be made out, I hope, it will be granted, that the force and vigour of their Wit did more hurt, then good: and onely

onely ſerv'd to carry them the faſter out of the right way, when they were once going. The *Peripateticks* themſelves do all grant, that the firſt riſe of knowledge muſt be from the *Senſes*, and from an induction of their reports: Well then; how could the *Schole-men* be proper for ſuch a buſineſs, who were ty'd by their Cloyſterall life, to ſuch a ſtrictneſs of hours, and had ſeldom any larger proſpects of *Nature*, then the Gardens of their *Monaſtries?* It is a common obſervation, that mens ſtudies are various, according to the different courſes of life, to which they apply themſelves; or the tempers of the places, wherein they live. They who are bred up in *Commonwealths*, where the greateſt affairs are manag'd by the violence of popular aſſemblies, and thoſe govern'd by the moſt plauſible ſpeakers: buſie themſelves chiefly about *Eloquence*; they who follow a *Court*, eſpecially intend the ornament of Language, and *Poetry*, and ſuch more delicate Arts, which are uſually there in moſt requeſt: they who retire from humane things, and ſhut themſelves up in a narrow compaſs, keeping company with a very few, and that too in a ſolemne way, addict themſelves, for the moſt part, to ſome melancholy contemplations, or to *devotion*, and the thoughts of another world. That therefore which was fitteſt for the *Schole-mens* way of life, we will allow them. But what ſorry kinds of Philoſophy muſt they needs produce, when it was a part of their *Religion*, to ſeparate themſelves, as much as they could, from the converſe of mankind? when they were ſo farr from being able to diſcover the ſecrets of *Nature*, that they had ſcarce opportunity, to behold enough of its common works? If any ſhall be inclinable to fol-

low the directions of ſuch men in Natural things, rather then of thoſe, who make it their employment: I ſhall believe, they will be irrational enough, to think, that a man may draw an exacter Deſcription of *England*, who has never been here, then the moſt induſtrious Mr. *Cambden*, who had travell'd over every part of this Country, for that very purpoſe.

Whoever ſhall ſoberly profeſs, to be willing to put their ſhoulders, under the burthen of ſo great an enterpriſe, as to repreſent to mankind, the whole Fabrick, the parts, the cauſes, the effects of Nature: ought to have their eyes in all parts, and to receive information from every quarter of the earth: they ought to have a conſtant univerſall intelligence: all diſcoveries ſhould be brought to them: the Treaſuries of all former times ſhould be laid open before them: the aſſiſtance of the preſent ſhould be allow'd them: ſo farr are the narrow conceptions of a few private Writers, in a dark Age, from being equall to ſo vaſt a deſign. There are indeed ſome operations of the mind, which may be beſt perform'd by the ſimple ſtrength of mens own particular thoughts; ſuch are invention, and judgement, and diſpoſition: For in them a ſecurity from noiſe, leaves the Soul at more liberty, to bring forth, order, and faſhion the heap of matter, which had been before ſupply'd to its uſe. But there are other works alſo, which require as much aid, and as many hands, as can be found. And ſuch is this of obſervation: Which is the great Foundation of Knowledge: Some muſt gather, ſome muſt bring, ſome ſeparate, ſome examine: and (to uſe a Similitude, which the preſent time of the year, and the ripe fields, that lye before

before my eyes, ſuggeſt to me) it is in *Philoſophy*, as in *Husbandry*: Wherein we ſee, that a few hands will ſerve to meaſure out, and fill into ſacks, that Corn, which requires very many more laborers, to ſow, and reap, and bind, and bring it into the Barn.

But now it is time for me to diſmiſs this ſubtle generation of Writers: whom I would not have proſecuted ſo farr, but that they are ſtill eſteem'd by ſome men, the onely Maſters of Reaſon. If they would be content, with any thing leſs then an Empire in Learning, we would grant them very much. We would permit them to be great, and profound Wits, as *Angelicall*, and *Seraphical*, as they pleas'd: We would commend them, as we are wont to do *Chaucer*; we would confeſs, that they are admirable in compariſon of the ignorance of their own Age: And, as Sir *Philip Sidney* of him, we would ſay of them; that it is to be wonder'd, how they could ſee ſo cleerly then, and we can ſee no cleerer now: But that they ſhould ſtill be ſet before us, as the great Oracles of all Wit, we can never allow. Suppoſe, that I ſhould grant, that they are moſt uſefull in the controverſies of our *Church*, to defend us againſt the Hereſies, and Schiſms of our times: what will thence follow, but that they ought to be confin'd, within their own Bounds, and not be ſuffer'd to hinder the enlargement of the territories of other *Sciences*? Let them ſtill prevail in the *Scholes*, and let them govern in diſputations: But let them not over-ſpread all ſorts of knowledge. That would be as ridiculous, as if, becauſe we ſee, that Thorns, and Briers, by reaſon of their ſharpneſs, are fit to ſtop a gap, and keep out wild Beaſts; we ſhould therefore think, they deſerv'd to be planted all over every Field.

And

And yet I ſhould not doubt, (if it were not ſomewhat improper to the preſent diſcourſe) to prove, that even in *Divinity* itſelf, they are not ſo neceſſary, as they are reputed to be: and that all, or moſt of our Religious controverſies, may be as well decided, by plain reaſon, and by conſiderations, which may be fetch'd from the *Religion* of *mankind*, the Nature of *Government*, and *humane Society*, and *Scripture* itſelf, as by the multitudes of Authorities, and ſubtleties of diſputes, which have been heretofore in uſe.

Sect X. *The Reſtoration of Learning.*

And now I am come to the time within our view, and to the *third great Age* of the *flouriſhing* of *Learning*. Whether this recovery of knowledge did happen by the benefit of *Printing*, invented about that time, which ſhew'd a very eaſie way of communicating mens thoughts one to another? or whether it came from the hatred, which was then generally conceiv'd againſt the blindneſs, and ſtupidity, of the *Roman Fryers?* or from the *Reformation*, which put men upon a ſtricter inquiry into the Truth of things? whatever the *cauſe* was, I will not take much pains to determine: But I will rather obſerve, what kinds of knowledge have moſt flouriſh'd upon it. If we compare this *Age* of *Learning*, with the *two former*; we ſhall find, that this does far exceed both the other in its extent: there being a much larger plot of ground, ſown with Arts, and civility at this time, then either when the *Grecian*, or *Roman* Empires prevail'd. For then (eſpecially under the *Romans*) ſo many Nations being united under one *Dominion*, and reduc'd into the Form of *Provinces*: that knowledge which they had was chiefly confin'd

to

to the walls of the *Imperial Cities* themſelves. But now (not to inſiſt on the Learning of farr remote Countries, of which we have onely imperfect Relations; but to contract our obſervation to *Chriſtendom* alone) there being ſo many different *States*, and *Governments* in *Europe*, every Country ſets up for itſelf: almoſt in every place, the liberal Arts (as they are call'd) are cheriſh'd, and publick allowance is made for their ſupport. And in this compaſs, the infinit numbers of Wits, which have appear'd ſo thick for theſe many years, have been chiefly taken up about ſome of theſe three ſtudies: either the *Writings* of the *Antients*; or *Controverſies* of *Religion*: or *Affairs* of *State*.

Sect XI. *The Recovery of the Antients.*

The Firſt thing that was undertaken, was to reſcue the excellent works of former *Writers* from obſcurity. To the better performing of this, many things contributed about that time. Amongſt which, as to us in *England*, I may reckon (and that too, it may be, not the leaſt, whatever the action was in itſelf,) the diſſolution of *Abbyes*: whereby their Libraries came forth into the light, and fell into induſtrious Mens hands, who underſtood how to make more uſe of them, then their ſlothfull poſſeſſors had done. So that now the *Greek*, and *Latine* Tongues began to be in requeſt; and all the ancient Authors, the *Hethen Philoſophers*, *Mathematicians*, *Orators*, *Hiſtorians*, *Poets*, the various Copies, and Tranſlations of the *Bible*, and the *Primitive Fathers* were produc'd. All theſe, by the ſeverall Tranſcriptions, and the ignorance of the Tranſcribers had very many different readings, and many parts wholly loſt; and by the diſtance of times, and change of cuſtoms, were

were grown obſcure. About the interpreting, explaining, ſupplying, commenting on theſe, almoſt all the firſt Wits were employed. A work of great uſe, and for which we ought to eſteem our ſelves much beholding to them. For indeed, if they had not compleated that buſineſs, to our hands, we of this age, had not been ſo much at leiſure, as now I hope we are, to proſecute new inventions. If they had not done it, we ſhould: of which we ought not to doubt, ſeeing we behold, that even now, when the ſoyl of Criticiſm is almoſt quite Barren, and hardly another Crop will come, yet many Learned men cannot forbear ſpending their whole labour in toying about it: what then ſhould we have done, if all thoſe Books had come down untouch'd to our hands?

We cannot then, with any ſobriety, detract from the *Criticks*, and *Philologiſts*, whoſe labors we injoy. But we ought rather to give them this Teſtimony, that they were men of admirable Diligence: and that the Collections, which they have made, out of the Monuments of the *Antients*, will be wonderfully advantageous to us, if the right uſe be made of them: if they be not ſet before us, onely that we may ſpend our whole Lives, in their conſideration, and to make the courſe of Learning more difficult: But if they be imploy'd, to direct us in the ways, that we ought to proceed, in knowledge for the future; if by ſhewing us what has been already finiſh'd, they point out to us, the moſt probable means, to accompliſh what is behind. For methinks, that wiſdom, which they fetch'd from the aſhes of the dead, is ſomething of the ſame nature, with Aſhes themſelves: which, if they are kept up in heaps together, will

will be uſeleſs: But if they are ſcattred upon Living ground, they will make it more fertile, in the bringing forth of various ſorts of Fruits. To theſe men then we are beholding, that we have a fairer proſpect about us: to them we owe, that we are not ignorant of the times that are gone before us: which to be, is (as *Tully* ſays) *to be always Children.* All this, and much more, is to be acknowledg'd: But then we ſhall alſo deſire of them, that they would content themſelves, with what is their due: that by what they have diſcover'd, amongſt the rubbiſh of the *Antients*, they would not contemn the Treaſures, either lately found out, or ſtill unknown: and that they would not prefer the *Gold* of *Ophir*, of which now there is no mention, but in Books, before the preſent Mountains of the *Weſt-Indies.*

Sect. XII. *Religious controverſies and Arts of Policy.*

Thus I paſs over this ſort of *reviv'd Learning.* And now there comes into our view another remarkable occaſion, of the hinderance of the growth of *Experimentall Philoſophy*, within the compaſs of this bright Age; and that is the great a-do which has been made, in raiſing, and confirming, and refuting ſo many different Sects, and opinions of the *Chriſtian Faith.* For whatever other hurt or good comes, by ſuch holy ſpeculative Warrs (of which whether the benefit or miſchief over-weighs, I will not now examine) yet certainly by this means, the knowledge of Nature has been very much retarded. And (to uſe that Metaphor, which an excellent *Poet* of our Nation, turns to another purpoſe) that ſhowre has done very much injury by falling on the Sea, for which the Shepherd, and the Plough-man, call'd in vain: The Wit of men has been profuſely powr'd out

on *Religion*, which needed not its help, and which was onely thereby made more tempeſtuous: while it might have been more fruitfully ſpent, on ſome parts of Philoſophy, which have been hitherto barren, and might ſoon have been made fertil.

But beſides this, there have been alſo ſeveral other *profeſſions*, which have drawn away the Inclinations of Men, from proſecuting the naked, and unintereſſed Truth. And of theſe I ſhall chiefly name the *affairs* of *State*, the adminiſtration of Civil Government, and the execution of Laws. Theſe by their fair dowry of gain, and honor, have always allur'd the greateſt part of the men of Art, and reaſon, to addict themſelves to them: while the ſearch into ſeverer knowledge has been lookt on, as a ſtudy out of the way, fitter for a melancholy humoriſt, or a retir'd weak ſpirit, then to make men equal to buſineſs, or ſerviceable to their Country. And in this, methinks the *Experimental Philoſophy* has met with very hard uſage: For it has commonly in Mens Cenſures, undergone the imputation of thoſe very faults, which it indeavors to correct in the *Verbal*. That indeed may be juſtly condemn'd for filling mens thoughts, with imaginary Ideas of conceptions, that are no way anſwerable to the practical ends of Life: But this on the other ſide (as I ſhall ſhortly make out) is the ſureſt guide, againſt ſuch Notional wandrings: opens our eyes, to perceive all the realities of things: and cleers the brain, not onely from darkneſs, but falſe, or uſeleſs Light. This is certainly ſo, in the thing it ſelf. But the greateſt part of men, have ſtill apprehended the contrary. If they can bring ſuch Inquirers under the ſcornfull Titles of *Philoſophers*, or *Schollars*, or *Virtuoſi*, it is enough: They preſently

ſently conclude them, to be men of another World, onely fit companions for the ſhadow, and their own melancholy whimſies: looking on thoſe who dig in the Mine of Nature, to be in as bad a condition, as the *King* of *Spains* ſlaves in *Peru*, condemn'd for ever to that drudgery, and never to be redeem'd to any other imployment. And is not this a very unequal proceeding? While ſome over-zealous *Divines* do reprobate Natural Philoſophy, as a carnal knowledge, and a too much minding worldly things: the men of the World, and buſineſs on the other ſide, eſteem it meerly as an idle matter of Fancy, and as that which diſables us, from taking right meaſures in humane affairs. Thus by the one party, it is cenſured, for ſtooping too low; by the other, for ſoaring too high: ſo that methinks, it is a good ground to conclude, that it is guilty of neither of theſe faults, ſeeing it is alike condemn'd by both the extreams. But I ſhall have a fitter occaſion, to examine this hereafter. However it be, it is not to be wonder'd, if men have not been very zealous about thoſe ſtudies, which have been ſo farr remov'd, from preſent benefit, and from the applauſe of men. For what ſhould incite them, to beſtow their time, and Art, in revealing to mankind, thoſe Myſteries; for which, it may be, they would be onely deſpis'd at laſt? How few muſt there needs be, who will be willing, to be impoveriſh'd for the common good? which they ſhall ſee, all the rewards, which might give life to their Induſtry, paſſing by them, and beſtow'd on the deſerts of eaſier ſtudies? and while they for all their pains, and publick ſpirit, ſhall only perhaps be ſerv'd as the poor man was in the *Fable*: who, while he went down into the well, in aſſurance,

that he ſhould find a mighty Treaſure there, was in the mean time robb'd by his companions, that ſtay'd above, of his Cloak, and all the Booty that he had before gotten?

The Philoſophy of the Moderns.

And yet, notwithſtanding all theſe unfortunate hinderances, there have been many commendable attempts in this way, in the compaſs of our Memories, and the Age before us. And though they have been for the moſt part carry'd on, by the private Diligence of ſome few Men, in the mid'ſt of a thouſand difficulties, yet it will not be unprofitable to recount ſome of them: if it were onely to give a fair ground of hope, how much progreſs may be made by a form'd and Regular *Aſſembly*, ſeeing ſome ſingle hands, with ſo ſmall incouragement, could diſpatch ſo much of the work.

There are Five *new ways* of *Philoſophy*, that come into my obſervation.

Sect. XIII. *Modern Dogmatiſts.*

The Firſt is, of thoſe, who, out of a juſt diſdain, that the *Antients* ſhould ſtill poſſeſs a Tyranny over our Judgements, began firſt to put off the reverence, that men had born to their memories; and handling them more familiarly, made an exact ſurvey of their imperfections: But then having rejected them, they purſued their ſucceſs too far, and ſtraight fell to form and impoſe new Theories on Mens Reaſon, with an uſurpation, as great as that of the others: An action, which we that live in this Age, may reſemble to ſome things that we have ſeen acted on the Stage of the World: For we alſo have beheld the Pretenders to publick Liberty, turn the greateſt *Tyrants* themſelves. The firſt part of theſe mens performance is very much to the prais'd: They have made the ground

ground open, and cleer, for us: they have remov'd the rubbiſh; which, when one great Fabrick is to be pull'd down, and another to be erected in its ſtead, is always eſteem'd well nigh half the whole work: Their adventure was bold, and hazardous: They touch'd mens minds in their tendereſt part, when they ſtrove to pluck off thoſe opinions, which had, by long cuſtom, been ſo cloſely twin'd about them: They freed our underſtandings from the Charms of vain apparitions, and a ſlavery to dead Mens names. And we may well gheſs, that the abſolute perfection of the *True Philoſophy*, is not now far off, ſeeing this firſt great and neceſſary preparation for its coming, is already taken off our hands. For methinks there is an agreement, between the growth of *Learning*, and of *Civil Government*. The Method of the riſe and increaſe of that, was, this. At firſt in every Country, there prevail'd nothing, but Barbariſm, and Rudeneſs: All places were terrible with *Gyants*, and enchantments, and inſolent Uſurpers: Againſt theſe there firſt aroſe ſome mighty *Heroes*, as *Hercules*, *Theſeus*, and *Jaſon*: Theſe ſcowr'd the World, redreſs'd injuries, deſtroy'd Monſters: and for this they were made *Demi-gods*. But then they gave over, and it was left to the great Men, who ſucceeded them, as *Solon*, and *Lycurgus*, to accompliſh the Work, to found Common-wealths, to give Laws, to put Juſtice in its courſe: And why may I not now preſume (as many others have done before me) to reduce theſe ſtories to a Philoſophical ſence? Firſt then, the Phantaſms, and Fairies, and venerable Images of Antiquity, did long haunt the World: againſt theſe we have had our Champions; and without all queſtion, they had the better of the cauſe

cauſe: and now we have good ground to truſt, that theſe Illuſions being well over, the laſt finiſhing of this great Work, is nigh at hand, and is reſerv'd for this undertaking.

So then, thus farr they did well. But in the ſecond part of their Enterprize, they themſelves ſeem to me to have run into the ſame miſtake, for which we chiefly complain'd againſt thoſe *Antients*, whoſe Authority they deſtroy'd. The greateſt occaſion of our diſſenting from the *Greek Philoſophers*, and eſpecially from *Ariſtotle*, was, that they made too much haſt to ſeiſe on the prize, before they were at the end of the Race: that they fix'd, and determin'd their judgements, on general concluſions too ſoon, and ſo could not afterwards alter them, by any new appearances, which might repreſent themſelves. And may we not ſuppoſe, that poſterity will have the ſame quarrel at theſe mens labors? We do not fall foul upon Antiquity, out of any ſingularity of opinion, or a preſumptuous confidence of the ſtrength of our Wits above theirs. We admire the men, but onely diſlike the Method of their proceedings. And can we forbear murmuring, if we ſee our *contemporaries* diſdain them, and yet imitate their failings? If we muſt conſtitute a Sovereignty over our Reaſons; I know not, why we ſhould not allow this Dominion to the *Antients*, rather then to any one of the Moderns. They are all dead long ſince: and though we ſhould be over-reach'd by them in ſome few falſehoods, yet there is no danger, leſt they ſhould increaſe them upon us: whereas, if we once hang on the lips, of the wiſeſt men now Living; we are ſtill in their Power, and under their Diſcipline, and ſubject to be led by all their Dictates for the future. It

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is true indeed, a diligent *Inquirer* of theſe times, may gather as much experience, and in probability, conclude as rightly, as a whole *Academy*, or Sect of theirs could: yet I ſhall ſtill deny, that any one Man, though he has the nimbleſt, and moſt univerſal obſervation, can ever, in the compaſs of his life, lay up enough knowledge, to ſuffice all that ſhall come after him to reſt upon, without the help of any new Inquiries.

And if we ſuppoſe the beſt, that ſome one Man, by wonderful ſagacity, or extraordinary chance, ſhall light upon the True Principles of Natural Philoſophy: yet what will be the profit, of ſuch univerſal Demonſtrations, if they are onely fitted for talk, and the ſolving of appearances? Will there be any great matter, whether they are certain, or doubtful; old, or new; if they muſt be onely bounded to a ſyſteme, and confin'd to diſcourſe? The True Philoſophy muſt be firſt of all begun, on a ſcrupulous, and ſevere examination of particulars: from them, there may be ſome general Rules, with great caution drawn: But it muſt not reſt there, nor is that the moſt difficult part of its courſe: It muſt advance thoſe Principles, to the finding out of new effects, through all the varieties of Matter: and ſo both the courſes muſt proceed orderly together; from experimenting, to Demonſtrating, and from demonſtrating, to Experimenting again. I hope I ſhall content my Reader, if I onely give one inſtance in this caſe. It is probable, that he, who firſt diſcover'd, that all things were order'd in *Nature* by *Motion*; went upon a better ground, then any before him. But now if he will onely manage this, by nicely diſputing about the Nature, and Cauſes of

Motion

Motion in general; and not proſecute it through all particular Bodies: to what will he at laſt arrive, but onely to a better ſort of *Metaphyſicks*? And it may be, his Followers, ſome Ages hence, will divide his Doctrine into as many diſtinctions, as the *Schole-men* did that of *Matter*, and *Form*: and ſo the whole life of it, will alſo vaniſh away, into air, and words, as that of theirs has already done.

Sect. XIV. *The ill effects of Dogmatical Philoſophy.*

But it is time for me to give over this Argument; in which I fear, that what I have already ſaid, will alarm ſome excellent men, whoſe abilities I admire: who may perhaps ſuſpect, that it has bin with a particular reflexion. I might ſay for my ſelf, That firſt they muſt paſs ſentence on themſelves, before they can think ſo, ſeeing I have nam'd no man. But I will rather ſincerely profeſs, that I had no ſatyrical Sence, but onely declar'd againſt *Dogmatiſts* in general. And I cannot repent my having done it, while I perceive, there are two very dangerous miſchiefs, which are caus'd by that way of Philoſophy. The one is, that it makes men give over, and believe that they are ſatisfi'd, too ſoon. This is of very ill conſequence: For thereby mens induſtry will be ſlackned, and all the motives to any farther purſuit taken away. And indeed this is an error, which is very natural to mens minds: they love not a long and a tedious doubting, though it brings them at laſt to a real certainty: but they chooſe rather to conclude preſently, then to be long in ſuſpence, though to better purpoſe. And it is with moſt mens underſtandings, as with their eyes; to which thoſe ſeem the moſt delightful proſpects, where varieties of Hills, and Woods, do ſoon bound their wandrings; then where there is one large

large ſmooth *campagne*, over which they may ſee much farther, but where there is nothing to delay, and ſtop, and divert the ſight.

But the other ill effect of which I ſhall take notice, is, that it commonly inclines ſuch men, who think themſelves already reſolv'd, and immoveable in their opinions, to be more imperious, and impatient of contradiction, then becomes the calmneſs, and unpaſſionate evenneſs of the true Philoſophical Spirit. It makes them prone to undervalue other mens labours, and to neglect the real advantage, that may be gotten by their aſſiſtance; leaſt they ſhould ſeem to darken their own glory. This is a temper of mind, of all others the moſt pernicious; to which I may chiefly attribute the ſlowneſs of the increaſe of knowledge amongſt men. For what great things can be expected, if mens underſtandings ſhall be (as it were) always in the warlike State of Nature, one againſt another? if every one be jealous of anothers inventions, and ſtill ready to put a ſtop to his conqueſts? Will there not be the ſame wild condition in Learning, which had been amongſt men, if they had always been diſpers'd, ſtill preying upon, and ſpoiling their neighbors? If that had ſtill continued, no Cities had been built, no Trades found out, no Civility taught: For all theſe noble productions came from mens joyning in compacts, and entring into *Society*. It is a uſual ſaying, that *Where the Natural Philoſopher ends, the Phyſitian muſt begin:* and I will alſo add, that *The Natural Philoſopher is to begin, where the Moral ends.* It is requiſite, that he who goes about ſuch an undertaking, ſhould firſt know himſelf, ſhould be well-practis'd in all the modeſt, humble, friendly Vertues: ſhould be willing

to be taught, and to give way to the Judgement of others. And I dare boldly ſay, that a plain, induſtrious Man, ſo prepar'd, is more likely to make a good Philoſopher, then all the high, earneſt, inſulting Wits, who can neither bear partnerſhip, nor oppoſition. The *Chymiſts* lay it down, as a neceſſary qualification of their happy Man, to whom God will reveal their ador'd *Elixir*, that he muſt be rather innocent, and vertuous, then knowing. And if I were to form the Character of a True Philoſopher, I would be ſure to make that the Foundation: Not that I believe, God will beſtow any extraordinary Light in Nature, on ſuch men more then others: But upon a bare, rational account: For certainly ſuch men, whoſe minds are ſo ſoft, ſo yielding, ſo complying, ſo large, are in a far better way, then the Bold, and haughty Aſſertors: they will paſs by nothing, by which they may learn: they will be always ready to receive, and communicate Obſervations: they will not contemn the Fruits of others diligence: they will rejoyce, to ſee mankind benefited, whether it be by themſelves, or others.

Sect. XV. *The Reviewers of the Antient Sects.*

The ſecond indeavors, have been of thoſe, who renounc'd the Authority of *Ariſtotle:* But then reſtor'd ſome one or other of the *Antient Sects* in his ſtead. If ſuch mens intentions were onely, that we might have before us, the conceptions of ſeveral men, of different Ages, upon the works of Nature, without obliging us to an implicit conſent to all that they affirm; then their labors ought to be receiv'd with great acknowledgements: For ſuch a general proſpect will very much inlarge, and guide our inquiry: and perhaps alſo will help to hinder the Age from

from ever falling back again into a ſubjection to one uſurping Philoſopher. But if their purpoſe was, to erect thoſe Scholes which they reviv'd, into as abſolute a power, as the *Peripateticks* had heretofore: if they ſtrive to make a competition between *Ariſtotle*, and *Epicurus*, or *Democritus*, or *Philolaus*: they do not contribute very much, towards the main deſign. For towards that, it is not enough, that the *Tyrant* be chang'd; but the *Tyranny* it ſelf muſt be wholy taken away.

Sect. XVI. *Modern Experimenters.*

The *Third* ſort of *new Philoſophers*, have been thoſe, who have not onely diſagreed from the *Antients*, but have alſo propos'd to themſelves the right courſe of ſtudy, and ſure *Experimenting*: and have proſecuted it as far, as the ſhortneſs of their own Lives, or the multiplicity of their other affairs, or the narrowneſs of their Fortunes, have given them leave. Such as theſe, we are to expect to be but few: for they muſt deveſt themſelves of many vain conceptions, and overcome a thouſand falſe Images, which lye like Monſters in their way, before they can get as far as this. And of theſe, I ſhall onely mention one great Man, who had the true Imagination of the whole extent of this Enterprize, as it is now ſet on foot; and that is, the *Lord Bacon*. In whoſe Books there are every where ſcattered the beſt arguments, that can be produc'd for the defence of Experimental Philoſophy; and the beſt directions, that are needful to promote it. All which he has already adorn'd with ſo much Art; that if my deſires could have prevail'd with ſome excellent Friends of mine, who engag'd me to this Work: there ſhould have been no other Preface to the *Hiſtory* of the *Royal Society*,

ciety, but ſome of his Writings. But methinks, in this one Man, I do at once find enough occaſion, to admire the ſtrength of humane Wit, and to bewail the weakneſs of a Mortal condition. For is it not wonderful, that he, who had run through all the degrees of that *profeſſion*, which uſually takes up mens whole time; who had ſtudied, and practis'd, and govern'd the *Common Law*: who had always liv'd in the crowd, and born the greateſt Burden of Civil buſineſs: ſhould yet find leiſure enough for theſe retir'd Studies, to excel all thoſe men, who ſeparate themſelves for this very purpoſe? He was a Man of ſtrong, cleer, and powerful Imaginations: his Genius was ſearching, and inimitable: and of this I need give no other proof, then his Style it ſelf; which as, for the moſt part, it deſcribes mens minds, as well as Pictures do their Bodies; ſo it did his above all men living. The courſe of it vigorous, and majeſtical: The Wit Bold, and Familiar: The compariſons fetch'd out of the way, and yet the moſt eaſie: in all, expreſſing a ſoul, equally skill'd in Men, and Nature. All this, and much more is true of him: But yet his *Philoſophical Works* do ſhew, that a ſingle, and buſie hand can never graſp all this whole Deſign, of which we treat. His Rules were admirable: yet his *Hiſtory* not ſo faithful, as might have been wiſh'd in many places, he ſeems rather to take all that comes, then to chooſe; and to heap, rather, then to regiſter. But I hope this accuſation of mine can be no great injury to his Memory; ſeeing, at the ſame time, that I ſay he had not the ſtrength of a thouſand men; I do alſo allow him to have had as much as twenty.

The

Sect. XVII. *The Chymists.*

The next Philoſophers, whom I ſhall touch upon, are the *Chymiſts*, who have been more numerous, in this later Age, then ever before. And without queſtion, they have lighted upon the right Inſtrument of great productions, and alterations: which muſt for the moſt part be perform'd by Fire. They may be divided into three rancks: Such, as look after the knowledge of Nature in general: Such, as ſeek out, and prepare Medicines: and ſuch, as ſearch after riches, by Tranſmutations, and the great *Elixir*. The two firſt, have been very ſucceſsful, in ſeparating, compounding, and changing the parts of things: and in ſhewing the admirable powers of Nature, in the raiſing of new conſiſtencies, figures, colors, and vertues of Bodies. And from their labors, the true *Philoſophy* is like to receive the nobleſt Improvements. But the pretenſions of the Third kind, are not onely to indow us, with all the benefits of this life, but with Immortality it ſelf. And their ſucceſs has been as ſmall, as their deſign was extravagant. Their Writers involve them in ſuch darkneſs; that I ſcarce know, which was the greateſt task, to underſtand their meaning, or to effect it. And in the chaſe of the *Philoſopher's Stone*, they are ſo earneſt, that they are ſcarce capable of any other thoughts: ſo that if an Experiment lye never ſo little out of their rode, it is free from their diſcovery: as I have heard of ſome creatures in *Africk*, which ſtill going a violent pace ſtraight on, and not being able to turn themſelves, can never get any prey, but what they meet juſt in their way. This ſecret they proſecute ſo impetuouſly, that they believe they ſee ſome footſteps of it, in every line of *Moſes*, *Solomon*, or *Virgil*. The truth is, they are downright *Enthuſiaſts* about

about it. And ſeeing we caſt *Enthuſiaſm* out of *Divinity* it ſelf, we ſhall hardly ſure be perſwaded, to admit it into Philoſophy. It were perhaps a vain attempt, to try to cure ſuch Men of their groundleſs hopes. It may be they are happier now, as they are. And they would onely cry out with the Man in *Horace*, that their Friends, who had reſtor'd them to a perfect ſenſe, had murder'd them. But certainly, if they could be brought to content themſelves with moderate things, to grow rich by degrees, and not to imagine, they ſhall gain the *Indies*, out of every *Crucible*: there might be wonderful things expected from them. And of this we have good aſſurance, by what is come abroad from divers eminent Perſons: amongſt whom ſome are members of the *Royal Society*. And, if it were not already excellently perform'd by others, I might here ſpeak largely, of the advantages that accrue to Phyſick, by the induſtrious labors of ſuch *Chymiſts*, as have onely the diſcreet, and ſober flame, and not the wild lightning of the others Brains.

Sect XVIII. *Thoſe that have handled particular Subjects.*

But the laſt kind, that I ſhall name, has been of thoſe, who, conſcious of humane frailty, and of the vaſtneſs of the Deſign of an *univerſal Philoſophy*; have ſeparated, and choſen out for themſelves, ſome particular Subjects, about which to beſtow their diligence. In theſe, there was leſs hazard of failing: theſe by one mans Induſtry, and conſtant indeavors, might probably at laſt be overcome. And indeed they have generally reap'd the fruits of their modeſty. I have but one thing to except againſt ſome few of them: that they have been ſometimes a little too forward to conclude upon *Axioms*, from what they

they have found out, in ſome particular Body. But that is a fault, which ought to be overwhelm'd by their other praiſes. And I ſhall boldly affirm, that if all other Philoſophical Matters had been as well, and as throughly ſifted, as ſome admirable Men of this Age have manag'd ſome parts of *Aſtronomy*, *Geometry*, *Anatomy*, &c. there would ſcarce any burden have remain'd, on the ſhoulders of our Poſterity: But they might have ſate quietly down, and injoy'd the pleaſure of the true *Speculative* Philoſophy, and the profit of the *Practical*.

To all theſe proceedings, that I have mention'd, there is as much honor to be payd, as can be due to any one ſingle humane Wit: But they muſt pardon us, if we ſtill prefer the joynt force of many men.

Sect. XIX. *Modern Academies for Language.*

And now it is much to be wonder'd, that there was never yet ſuch an *Aſſembly* erected, which might proceed, on ſome ſtanding conſtitutions of Experimenting. There have, 'tis true, of late, in many parts of *Europe*, ſome Gentlemen met together, ſubmitted to Common Laws, and form'd themſelves into *Academies*. But it has been, for the moſt part, to a far different purpoſe: and moſt of them only aim'd at the ſmoothing of their Style, and the Language of their Country. Of theſe, the firſt aroſe in *Italy*; where they have ſince ſo much abounded, that there was ſcarce any one great City without one of theſe *combinations*. But that, which excell'd all the other, and kept it ſelf longer untainted from the corruptions of ſpeech, was the *French Academy* at *Paris*. This was compos'd of the nobleſt Authors of that Nation: and had for its *Founder*, the *Great Cardinal de Richelieu*: who, amongſt all his cares, whereby he eſtabliſh'd,

bliſh'd, and enlarg'd that *Monarchy* ſo much, did often refreſh himſelf by directing, and taking an account of their progreſs. And indeed in his own life, he found ſo great ſucceſs of this Inſtitution, that he ſaw the *French Tongue* abundantly purifi'd, and beginning to take place in the Weſtern World, almoſt as much, as the *Greek* did of old, when it was the Language of Merchants, Souldiers, Courtiers, and Travellers. But I ſhall ſay no more of this *Academy*; that I may not deprive my Reader of the delight of peruſing their own *Hiſtory*, written by *Monſieur de Peliſſon*: which is ſo maſculinely, ſo chaſtly, and ſo unaffectedly done, that I can hardly forbear envying the *French Nation* this honor: that while the *Engliſh Royal Society* has ſo much out-gone their *Illuſtrious* Academy, in the greatneſs of its undertaking, it ſhould be ſo far ſhort of them in the abilities of its *Hiſtorian*. I have onely this to allege in my excuſe; that as they undertook the advancement of the Elegance of Speech, ſo it became their *Hiſtory*, to have ſome reſemblance to their enterprize: Whereas the intention of ours, being not the Artifice of Words, but a bare knowledge of things; my fault may be eſteem'd the leſs, that I have written of *Philoſophers*, without any ornament of *Eloquence*.

Sect. XX. *A propoſal for erecting an Engliſh Academy.*

I hope now, it will not be thought a vain digreſſion, if I ſtep a little aſide, to recommend the forming of ſuch an *Aſſembly*, to the Gentlemen of our Nation. I know indeed, that the *Engliſh Genius* is not ſo airy, and diſcourſive, as that of ſome of our neighbors, but that we generally love to have Reaſon ſet out in plain, undeceiving expreſſions; as much, as they to have it deliver'd with colour, and beauty. And beſides

ſides this, I underſtand well enough, that they have one great aſſiſtance, to the growth of Oratory, which to us is wanting: that is, that their Nobility live commonly cloſe together in their Cities, and ours for the moſt part ſcattered in their Country Houſes. For the ſame reaſon, why our ſtreets are not ſo well built as theirs, will hold alſo, for their exceeding us in the Arts of Speech: They prefer the Pleaſures of the Town; we, thoſe of the Field: whereas it is from the frequent converſations in Cities, that the Humour, and Wit, and Variety, and Elegance of Language, are chiefly to be fetch'd. But yet, notwithſtanding theſe diſcouragements, I ſhall not ſtick to ſay, that ſuch a project is now ſeaſonable to be ſet on foot, and may make a great Reformation in the manner of our Speaking, and Writing. Firſt, the thing itſelf is no way contemptible. For the purity of Speech, and greatneſs of Empire have in all Countries, ſtill met together. The *Greeks* ſpoke beſt, when they were in their glory of conqueſt: The *Romans* made thoſe times the Standard of their Wit, when they ſubdu'd, and gave Laws to to the World: And from thence, by degrees, they declin'd to corruption; as their valour, their prudence, and the honor of their Arms did decay: and at laſt, did even meet the *Northern Nations* half way in *Barbariſm*, a little before they were overrun by their *Armies*.

But beſides, if we obſerve well the *Engliſh Language*; we ſhall find, that it ſeems at this time more then others, to require ſome ſuch aid, to bring it to its laſt perfection. The Truth is, it has been hitherto a little too careleſsly handled; and I think, has had leſs labor ſpent about its poliſhing, then it de-

ſerves. Till the time of *King Henry* the *Eighth*, there was ſcarce any man regarded it, but *Chaucer*; and nothing was written in it, which one would be willing to read twice, but ſome of his *Poetry*. But then it began to raiſe it ſelf a little, and to ſound tolerably well. From that Age, down to the beginning of our late *Civil Wars*, it was ſtill faſhioning, and beautifying it ſelf. In the Wars themſelves (which is a time, wherein all Languages uſe, if ever, to increaſe by extraordinary degrees; for in ſuch buſie, and active times, there ariſe more new thoughts of men, which muſt be ſignifi'd, and varied by new expreſſions) then I ſay, it receiv'd many fantaſtical terms, which were introduc'd by our *Religious Sects*; and many outlandiſh phraſes, which ſeveral *Writers*, and *Tranſlators*, in that great hurry, brought in, and made free as they pleas'd, and with all it was inlarg'd by many ſound, and neceſſary Forms, and Idioms, which it before wanted. And now, when mens minds are ſomewhat ſettled, their Paſſions allai'd, and the peace of our Country gives us the opportunity of ſuch diverſions: if ſome ſober and judicious Men, would take the whole Maſs of our Language into their hands, as they find it, and would ſet a mark on the ill Words; correct thoſe, which are to be retain'd; admit, and eſtabliſh the good; and make ſome emendations in the Accent, and Grammar: I dare pronounce, that our *Speech* would quickly arrive at as much plenty, as it is capable to receive; and at the greateſt ſmoothneſs, which its derivation from the rough *German* will allow it.

Nor would I have this new *Engliſh Acamedy*, confin'd only to the weighing Words, and Letters: But there may be alſo greater Works found out for it. By many

many ſigns we may gheſs, that the Wits of our Nation, are not inferior to any other; and that they have an excellent mixture of the Spirit of the *French*, and the *Spaniard*: and I am confident, that we only want a few more ſtanding Examples, and a little more familiarity with the Antients, to excel all the Moderns. Now the beſt means, that can be devis'd to bring that about, is to ſettle a fixt, and *Impartial Court* of *Eloquence*; according to whoſe Cenſure, all Books, or Authors ſhould either ſtand or fall. And above all, there might be recommended to them one Principal Work, in which we are yet defective; and that is, the compiling of a *Hiſtory* of our late *Civil Wars*. Of all the labors of mens Wit, and Induſtry, I ſcarce know any, that can be more uſeful to the World, then *Civil Hiſtory*: if it were written, with that ſincerity, and majeſty, as it ought to be, as a faithful Idea of humane Actions. And it is obſervable, that almoſt in all civiliz'd Countries, it has been the laſt thing, that has come to perfection. I may now ſay, that the *Engliſh* can already ſhew many induſtrious, and worthy Pieces in this kind: But yet, I have ſome Prophetical imagination in my thoughts, that there is ſtill behind, ſomething Greater, then any we have yet ſeen, reſerv'd for the Glory of this Age. One Reaſon of this my ſtrong perſuaſion, is a compariſon, that I make, between the condition of our *State*, and that of the *Romans*. They at firſt writ, in this way, not much better then our *Moncks*: onely Regiſtring in an undigeſted manner, ſome few naked Breviaries of their Wars, and Leagues, and Acts, of their City Magiſtrates. And indeed they advanc'd forward by very ſlow degrees: For I remember, that *Tully* ſomewhere complains, in theſe

Words: *Hiſtoria nondum latinis literis illuſtrata.* But it was in the peaceful reign of *Auguſtus*, after the concluſion of their long Civil Wars, that moſt of their perfect *Hiſtorians* appear'd. And it ſeems to me, that we may expect the ſame progreſs amongſt us. There lye now ready in Bank, the moſt memorable Actions of Twenty years: a Subject of as great Dignity, and Variety, as ever paſs'd under any Mans hands: the peace which we injoy, gives leiſure and incouragement enough: The effects of ſuch a Work would be wonderfully advantageous, to the ſafety of our Country, and to *His Majeſties* Intereſt: for there can be no better means to preſerve his Subjects in obedience for the future, than to give them a full view of the miſeries, that attended rebellion. There are onely therefore wanting, for the finiſhing of ſo brave an undertaking, the united indeavors of ſome publick minds, who are converſant both in Letters and buſineſs: and if it were appointed to be the labor of one or two men to compoſe it, and of ſuch an *Aſſembly*, to reviſe and correct it, it might certainly challenge all the Writings of paſt, or preſent Times.

But I ſee, I have already tranſgreſs'd: For I know it will be thought unadviſedly done, while I was inforcing a weightier Deſign, to ſtart, and to follow another of leſs moment. I ſhall therefore let it paſs as an extravagant conceit: only I ſhall affirm, that the *Royal Society* is ſo far from being like to put a ſtop to ſuch a buſineſs, that I know many of its Members, who are as able as any others, to aſſiſt in the bringing it into practice.

Thus I have diſpatch'd my firſt general Head; in which, it may be, it was not needful to have ſtay'd ſo long:

long: ſeeing, I am confident, I have ſaid nothing, but what was before very well known, and what paſſes about in common diſcourſe.

Sect XXI. *The Philoſophy of the Arabians.*

I did on purpoſe omit the *Learned Age* of the *Arabians*, in its proper place: becauſe I was reſolv'd, as I came down, to keep my ſelf as neer as I could, within the Bounds of *Chriſtendom*. But I ſhall now add, concerning them, that their Studies alſo were principally bent, upon expounding *Ariſtotle*, and the *Greek Phyſitians*. They were, without queſtion, men of a deep, and ſubtile Wit: which is a Character that it may be in all Ages has belong'd more rightly to the Tempers of the Southern, then of the Northern Countries: of this they have left many noble Teſtimonies behind them; ſo many, that (if we believe ſome worthy and induſtrious Men of our own Nation, who have ſearch'd into their Monuments) they might even almoſt be compar'd to *Rome*, and *Athens* themſelves. But they injoy'd not the light long enough. It brake forth upon the point of their greateſt conqueſts: It mainly conſiſted, in underſtanding the Antients: and what they would have done, when they had been weary of them, we cannot tell: For that Work was not fully over, before they were darkned by that, which made even *Greece* it ſelf Barbarous, the *Turkiſh Monarchy*. However, that knowledge, which they had, is the more remarkable, becauſe it ſprung up, in that part of the World, which has been almoſt always perverſly unlearned. For methinks, that ſmall Spot of Civil Arts, compar'd to their long courſe of ignorance, before, and after, bears ſome reſemblance with that Country it ſelf; where there are ſome few little Vallies, and Wells,

Wells, and pleaſant Shades of *Palm-Trees*; But thoſe lying in the midſt of Deſerts, and unpaſſable Tracts of Sands.

Sect. XXII. *A defence of the Royal Society, in reſpect of the Antients.*

But now it being a fit time to ſtop, and breathe a while, and to take a review of the ground, that we have paſs'd. It will be here needful for me, to make an Apology for my ſelf, in a matter, which, if it be not before-hand remov'd, may chance to be very prejudicial to mens good opinion of the *Royal Society* it ſelf, as well as of its *Hiſtorian*. I fear, that this *Aſſembly* will receive diſadvantage enough, from my weak management of their cauſe, in many other particulars: ſo that I muſt not leave them, and my ſelf unjuſtify'd, in this, wherein we have ſo much right on our ſides. I doubt not then, but it will come into the thoughts of many *Criticks*, (of whom the World is now full) to urge againſt us, that I have ſpoken a little too ſparingly of the Merits of former Ages; and that this Deſign ſeems to be promoted, with a malicious intention of diſgracing the Merits of the *Antients*.

But Firſt, I ſhall beſeech them, calmly to conſider; whether they themſelves do not more injure thoſe great Men, whom they would make the Maſters of our Judgments, by attributing all things to them ſo abſolutely; then we, who do them all the Juſtice we can, without adoring them? It is always eſteem'd the greateſt miſchief, a man can do thoſe whom he loves, to raiſe mens expectations of them too high, by undue, and impertinent commendations. For thereby not only their enemies, but indifferent men, will be ſecretly inclin'd to be more watchful over their failings, and to conſpire in beating down their Fame.

Fame. What then can be more dangerous to the honor of Antiquity; then to ſet its value at ſuch a rate, and to extol it ſo extravagantly, that it can never be able to bear the tryal, not onely of envious, but even of impartial Judges? It is natural to Mens minds, when they perceive others to arrogate more to themſelves, then is their ſhare; to deny them even that, which elſe they would confeſs to be their Right. And of the Truth of this, we have an inſtance of far greater concernment, then that which is before us. And that is, in *Religion* it ſelf. For while the *Biſhops* of *Rome* did aſſume an infallibility, and a ſovereign Dominion over our Faith: the *reformed Churches* did not onely juſtly refuſe to grant them that, but ſome of them thought themſelves oblig'd to forbear all communion with them, and would not give them that reſpect, which poſſibly might belong to ſo antient, and ſo famous a *Church*; and which might ſtill have been allowed it, without any danger of Superſtition.

But to carry this Diſpute a little farther: What is this, of which they accuſe us? They charge us with immodeſty in neglecting the guidance of wiſer, and more diſcerning Men, then our ſelves. But is not this rather the greateſt ſign of Modeſty, to confeſs, that we our ſelves may err, and all mankind beſides? To acknowledge the difficulties of Science? and to ſubmit our minds, to all the leaſt Works of Nature? What kind of behavior do they exact from us in this caſe? That we ſhould reverence the Footſteps of *Antiquity*? We do it moſt unanimouſly. That we ſhould ſubſcribe to their ſenſe, before our own? We are willing, in probabilities; but we cannot, in matters of Fact: for in them we follow the moſt antient

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Author of all others, even *Nature* it ſelf. Would they have us make our eies behold things, at no farther diſtance, than they ſaw? That is impoſſible; ſeeing we have the advantage of ſtanding upon their ſhoulders. They ſay, it is inſolence, to prefer our own inventions before thoſe of our *Anceſtors*. But do not even they the very ſame thing themſelves, in all the petty matters of life? In the Arts of War, and Government; In the making, and aboliſhing of Laws; nay even in the faſhion of their Cloaths, they differ from them, as their humour, or Fancy leads them. We approach the Antients, as we behold their Tombs, with veneration: but we would not therefore be confin'd to live in them altogether: nor would (I believe) any of thoſe, who profeſs to be moſt addicted to their Memories. They tell us, that in this corruption of Manners, and ſloth of Mens Minds, we cannot go beyond thoſe, who ſearch'd ſo diligently, and concluded ſo warily before us. But in this they are confuted by every days experience. They object to us *Tradition*, and the conſent of all Ages. But do we not yet know the deceitfulneſs of ſuch Words? Is any man, that is acquainted with the craft of founding *Sects*, or of managing Votes in *popular Aſſemblies*, ignorant, how eaſie it is to carry things in a violent ſtream? And when an opinion has once maſter'd its firſt oppoſers, and ſetled it ſelf in Mens Paſſions, or Intereſts: how few there be, that coldly conſider, what they admit for a long time after? So that when they ſay, that *all Antiquity* is againſt us; 'tis true, in ſhew, they object to us, the Wiſdom of many Ages; but in reality, they onely confront us, with the Authority of a few leading Men. Nay, what if I ſhould ſay, that this honor for the

the dead, which ſuch men pretend to, is rather a worſhiping of themſelves, than of the *Antients*? It may be well prov'd, that they are more in love with their own *Commentaries*, then with the *Texts* of thoſe, whom they ſeem to make their Oracles: and that they chiefly doat on thoſe Theories, which they themſelves have drawn from them: which, it is likely, are almoſt as far diſtant from the Original meaning of their *Authors*, as the Poſitions of the *New Philoſophers* themſelves.

But to conclude this Argument (for I am weary of walking in a rode ſo trodden) I think I am able to confute ſuch men by the practice of thoſe very *Antients*, to whom they ſtoop ſo low. Did not they truſt themſelves, and their own Reaſons? Did not they buſie themſelves in inquiry, make new Arts, eſtabliſh new Tenents, overthrow the old, and order all things as they pleas'd, without any ſervile Regard to their Predeceſſors? The *Grecians* all, or the greateſt part of them, fetch'd their Learning from *Egypt*. And did they blindly aſſent to all, that was taught them by the *Prieſts* of *Iſis*, and *Oſiris*? If ſo; then why did they not, together with their Arts, receive all the infinit Idolatries, which their Maſters embrac'd? ſeeing it is not to be queſtion'd, but the *Egyptians* deliver'd the rites of their Religion to ſtrangers, with as much Solemnity at leaſt, as they did the Myſteries of their *Hieroglyphicks* or *Philoſophy*. Now then, let *Pythagoras*, *Plato*, and *Ariſtotle*, and the reſt of their wiſe Men, be our examples, and we are ſafe. When they travell'd into the *Eaſt*, they collected what was fit for their purpoſe, and ſuitable to the Genius of their Country; and left the ſuperfluities behind them: They brought home ſome

of their uſeful Secrets: but ſtill counted their worſhiping a Dog, or an Onion, a Cat, or a Crocodile, ridiculous. And why ſhall not we be allow'd the ſame liberty, to diſtinguiſh, and chooſe, what we will follow? Eſpecially, ſeeing in this, they had a more certain way of being inſtructed by their Teachers, then we have by them: They were preſent on the place: They learn'd from the Men themſelves, by word of mouth; and ſo were in a likely courſe to apprehend all their Precepts aright: whereas we are to take their Doctrines, ſo many hundred years after their death, from their Books only, where they are for the moſt part ſo obſcurely expreſs'd, that they are ſcarce ſufficiently underſtood by the *Grammarians*, and *Linguiſts* themſelves, much leſs by the *Philoſophers*.

In few words therefore, let ſuch men believe, that we have no thought of detracting from what was good in former times: But, on the contrary, we have a mind to beſtow on them, a ſolid praiſe, inſteed of a great, and an empty. While we are raiſing new Obſervations upon Nature, we mean not to aboliſh the Old, which were well, and judiciouſly eſtabliſh'd by them: No more, then a *King*, when he makes a new Coyn of his own, does preſently call in that, which bears the Image of his Father: he onely intends thereby to increaſe the current Money of his Kingdom, and ſtill permits the one to paſs, as well as the other. It is probable enough, that upon a freſh ſurvey, we may find many things true, which they have before aſſerted: and then will not they receive a greater confirmation, from this our new and ſevere approbation, then from thoſe men, who reſign up their opinions to their Words only? It is the beſt way of honoring them, to ſeparate the certain things in them,

from

from the doubtful: For that ſhews, we are not ſo much carri'd towards them, by raſh affection, as by an unbyaſs'd Judgement. If we would do them the moſt right; it is not neceſſary we ſhould be perfectly like them in all things. There are two principal Ways of preſerving the Names of thoſe, that are paſs'd: The one, by *Pictures*; the other, by *Children*: The *Pictures* may be ſo made, that they may far neerer reſemble the Original, then *Children* do their Parents: and yet all Mankind chooſe rather to keep themſelves alive by Children, then by the other. It is beſt for the *Philoſophers* of this Age to imitate the *Antients* as their *Children*: to have their blood deriv'd down to them; but to add a new Complexion, and Life of their own: While thoſe, that indeavor to come neer them in every Line, and Feature, may rather be call'd their dead *Pictures*, or *Statues*, then their *Genuine Off-ſpring*.

The End of the Firſt Part.

THE HISTORY OF THE *ROYAL SOCIETY.*

The SECOND PART.

Section I. *The Diviſion of the Narration.*

THus I am, at length, arriv'd at the ſecond Part of my Method, The *Narration* it ſelf. This I ſhall divide into three Periods of Time, according to the ſeveral Degrees of the *preparation*, *growth*, and *compleat Conſtitution* of the *Royal Society.*

The Firſt ſhall conſiſt of the *firſt occaſions* of this Model, and the *Men*, who firſt devis'd to put it in execution: and ſhall end, where they began to make it a form'd, and *Regular Aſſembly.*

The Second ſhall trace out their *firſt attempts*, till they receiv'd the publick aſſiſtance of *Royal Authority.*

The Third ſhall deliver, what they *have done*, ſince they were made a *Royal Corporation.*

It may ſeem perhaps, that in paſſing through the firſt of theſe, I go too far back, and treat of things, that may appear to be of too private, and Domeſtick concernment, to be ſpoken in this publick way. But if this *Enterpriſe*, which is now ſo well eſtabliſh'd, ſhall be hereafter advantageous to Mankind (as I make no ſcruple to foretel, that it will)

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it is but juſt, that future times ſhould hear the *names*, of its firſt *Promoters*: That they may be able to render particular thanks to them, who firſt conceiv'd it in their minds, and practis'd ſome little draught of it long ago. And beſides, I never yet ſaw an Hiſtorian that was cleer from all Affections: that, it may be, were not ſo much to be call'd *Integrity*, as a ſtoical *inſenſibility*: Nor can I, more then others, reſiſt my inclinations, which ſtrongly force me to mention that, which will be for the honor of that place, where I receiv'd a great part of my Education. It was therefore, ſome ſpace after the end of the Civil Wars at *Oxford*, in *Dr. Wilkins* his Lodgings, in *Wadham College*, which was then the place of Reſort for Vertuous, and Learned Men, that the firſt meetings were made, which laid the foundation of all this that follow'd. The *Univerſity* had, at that time, many Members of its own, who had begun a *free way* of reaſoning; and was alſo frequented by ſome *Gentlemen*, of Philoſophical Minds, whom the misfortunes of the Kingdom, and the ſecurity and eaſe of a retirement amongſt Gown-men, had drawn thither.

Sect. II. *The Meetings at* Oxford.

Their firſt purpoſe was no more, then onely the ſatisfaction of breathing a freer air, and of converſing in quiet one with another, without being ingag'd in the paſſions, and madneſs of that diſmal Age. And from the Inſtitution of that *Aſſembly*, it had been enough, if no other advantage had come, but *this*: That by *this* means there was a race of yong Men provided, againſt the next Age, whoſe minds receiving from them, their firſt Impreſſions of *ſober* and *generous knowledge*, were invincibly arm'd againſt all the inchantments of *Enthuſiaſm*. But what is more, I may ventur.

venture to affirm, that it was in good meaſure, by the influence, which theſe Gentlemen had over the reſt, that the *Univerſity* it ſelf, or at leaſt, any part of its Diſcipline, and Order, was ſav'd from ruine. And from hence we may conclude, that the ſame Men have now no intention, of ſweeping away all the honor of Antiquity in this their new Deſign: ſeeing they imploy'd ſo much of their labor, and prudence, in preſerving that *moſt venerable Seat* of antient Learning, when their ſhrinking from its defence, would have been the ſpeedieſt way to have deſtroy'd it. For the Truth of this, I dare appeal to all unintereſſed men, who knew the Temper of that place; and eſpecially to thoſe who were my own contemporaries there: of whom I can name very many, whom the happy reſtoration of the Kingdom's peace, found as well inclin'd, to ſerve their *Prince*, and the *Church*, as if they had been bred up in the moſt proſperous condition of their Country. This was undoubtedly ſo. Nor indeed could it be otherwiſe: for ſuch *ſpiritual Frenſies*, which did then bear Rule, can never ſtand long, before a cleer, and a *deep skill* in *Nature*. It is almoſt impoſſible, that they, who converſe much with the ſubtilty of *things*, ſhould be deluded by ſuch *thick deceits*. There is but one better charm in the world, then *Real Philoſophy*, to allay the impulſes of the *falſe ſpirit*: and that is, the bleſſed preſence, and aſſiſtance of the *True*.

Nor were the good effects of this converſation, onely confin'd to *Oxford*: But they have made themſelves known in their printed Works, both in our own, and in the learned Language: which have much conduc'd to the Fame of our Nation *abroad*, and to the ſpreading of profitable Light, *at home*. This I truſt

truſt, will be univerſally acknowledg'd, when I ſhall have nam'd the Men. The principal, and moſt conſtant of them, were Doctor *Seth Ward*, the preſent Lord Biſhop of *Exeter*, Mr. *Boyl*, Dr. *Wilkins*, Sir *William Petty*, Mr. *Mathew Wren*, Dr. *Wallis*, Dr. *Goddard*, Dr. *Willis*, Dr. *Bathurſt*, Dr. *Chriſtopher Wren*, Mr. *Rook*: beſides ſeveral others, who joyn'd themſelves to them, upon occaſions. Now I have produc'd their Names, I am a little at a ſtand, how to deal with them. For, if I ſhould ſay what they deſerve; I fear it would be intepreted flatt'ry, inſteed of juſtice. And yet I have now lying in my ſight, the example of an *Elegant Book*, which I have profeſs'd to admire: whoſe Author ſticks not, to make large Panegyricks, on the Members of that *Aſſembly*, whoſe *Relation* he Writes. But this Preſident is not to be follow'd by a *yong Man*; who ought to be more jealous of publick cenſure, and is not enough confirm'd in the good liking of the world; to think, that he has ſuch a weighty, and difficult work, as the making of Characters, committed to him. I will therefore paſs by their praiſes in ſilence; though I believe, that what I might ſay of them, would be generally confeſs'd: and that if any ingenuous man, who knows them, or their writings, ſhould contradict me, he would alſo go neer to gainſay himſelf, and to retract the applauſes, which he had ſometime, or other, beſtow'd upon them.

For ſuch a candid, and unpaſſionate company, as that was, and for ſuch a gloomy ſeaſon, what could have been a fitter Subject to pitch upon, then *Natural Philoſophy?* To have been always toſſing about ſome *Theological queſtion*, would have been, to have made that their private diverſion, the exceſs of

which

which they themſelves diſlik'd in the publick: To have been eternally muſing on *Civil buſineſs*, and the diſtreſſes of their Country, was too melancholy a reflexion: It was *Nature* alone, which could pleaſantly entertain them, in that eſtate. The contemplation of that, draws our minds off from paſt, or preſent misfortunes, and makes them conquerers over things, in the greateſt publick unhappineſs: while the conſideration of *Men*, and *humane affairs*, may affect us, with a thouſand various diſquiets; *that* never ſeparates us into mortal Factions; *that* gives us room to differ, without animoſity; and permits us, to raiſe contrary imaginations upon it, without any danger of a *Civil War*.

Their *meetings* were as frequent, as their affairs permitted: their proceedings rather by action, then diſcourſe; cheifly attending ſome particular Trials, in *Chymiſtry*, or *Mechanicks*: they had no Rules nor Method fix'd: their intention was more, to communicate to each other, their diſcoveries, which they could make in ſo narrow a compaſs, than an united, conſtant, or regular inquiſition. And me thinks, their conſtitution did bear ſome reſemblance, to the *Academy* lately begun at *Paris*: where they have at laſt turn'd their thoughts, from *Words*, to experimental *Philoſophy*, and perhaps in imitation of the *Royal Society*. Their manner likewiſe, is to aſſemble in a private houſe, to reaſon freely upon the works of Nature; to paſs Conjectures, and propoſe Problems, on any Mathematical, or Philoſophical Matter, which comes in their way. And this is an Omen, on which I will build ſome hope, that as they agree with us in what was done at *Oxford*, ſo they will go on farther, and come by the ſame degrees, to erect another

another *Royal Society* in *France*. I promiſe for theſe Gentlemen here (ſo well I know the generoſity of their Deſign) that they will be moſt ready to accept their aſſiſtance. To them, and to all the Learned World beſides, they call for aid. No difference of *Country*, *Intereſt*, or profeſſion of *Religion*, will make them backward from taking, or affording help in this enterprize. And indeed all *Europe* at this time, have two general Wars, which they ought in honor to make: The one a *holy*, the other a *Philoſophical*: The one againſt the common Enemy of *Chriſtendom*, the other alſo againſt powerful, and barbarous Foes, that have not been fully ſubdu'd almoſt theſe ſix thouſand years, *Ignorance*, and *Falſe Opinions*. Againſt theſe, it becomes us, to go forth in one common expedition: All civil Nations joyning their *Armies* againſt the one, and their *Reaſon* againſt the other; without any petty contentions, about privileges, or precedence.

Sect. III. *Their firſt meetings at* London.

Thus they continued without any great Intermiſſions, till about the year 1658. But then being call'd away to ſeveral parts of the Nation, and the greateſt number of them coming to *London*, they uſually met at *Greſham* College, at the *Wedneſdays*, and *Thurſdays* Lectures of Dr. *Wren*, and Mr. *Rook*: where there joyn'd with them ſeveral eminent perſons of their common acquaintance: The Lord *Viſcount Brouncker*, the now Lord *Brereton*, Sir *Paul Neil*, Mr. *John Evelyn*, Mr. *Henſhaw*, Mr. *Slingsby*, Dr. *Timothy Clark*, Dr. *Ent*, Mr. *Ball*, Mr. *Hill*, Dr. *Crone*: and divers other Gentlemen, whoſe inclinations lay the ſame way. This Cuſtom was obſerv'd once, if not twice a week, in Term time; till they were ſcat-

t'red by the miſerable diſtractions of that Fatal year; till the continuance of their meetings there might have made them run the hazard of the fate of *Archimedes*: For then the place of their meeting was made a *Quarter* for *Soldiers*. But, (to make haſt through thoſe dreadful revolutions, which cannot be beheld upon Paper, without horror; unleſs we remember, that they had this one happy effect, to open mens eies to look out for the true Remedy) upon this follow'd the *King's* Return; and that, wrought by ſuch an admirable chain of events, that if we either regard the *eaſineſs*, or *ſpeed*, or *bleſſed iſſue* of the Work; it ſeems of it ſelf to contain variety, and pleaſure enough, to make recompence, for the whole Twenty years Melancholy, that had gone before. This I leave to another kind of Hiſtory to be deſcrib'd. It ſhall ſuffice my purpoſe, that Philoſophy had its ſhare, in the benefits of that glorious Action: For the *Royal Society* had its beginning in the wonderful pacifick year, 1660. So that, if any conjectures of good Fortune, from extraordinary *Nativities*, hold true; we may preſage all happineſs to this undertaking. And I ſhall here joyn my ſolemn wiſhes, that as it began in that time, when our Country was freed from confuſion, and ſlavery: So it may, in its progreſs, redeem the minds of Men, from obſcurity, uncertainty, and bondage.

Sect. IV. *The beginning of the Royal Society.*

Theſe Gentlemen therefore, finding the hearts of their Countrymen inlarg'd by their Joys, and fitted for any noble Propoſition: and meeting with the concurrence of many Worthy Men, who, to their immortal Honor, had follow'd the King in his baniſhment, Mr. *Erskins*, Sir *Robert Moray*, Sir *Gilbert Talbot*,

bot, &c. began now to imagine ſome greater thing; and to bring out experimental knowledge, from the *retreats*, in which it had long hid it ſelf, to take its part in the *Triumphs* of that univerſal Jubilee. And indeed Philoſophy did very well deſerve that Reward: having been always Loyal in the worſt of times: For though the Kings enemies had gain'd all other advantages; though they had all the Garriſons, and Fleets, and Ammunitions, and Treaſures, and Armies on their ſide: yet they could never, by all their Victories, bring over the Reaſon of Men to their Party.

While they were thus ord'ring their platform; there came forth a Treatiſe, which very much haſten'd its contrivance: and that was a Propoſal by Maſter *Cowley*, of erecting a Philoſophical College. The intent of it was, that in ſome place neer *London*, there ſhould liberal Salaries be beſtow'd, on a competent number of Learned Men, to whom ſhould be committed the operations of Natural Experiments. This Model was every way practicable: unleſs perhaps, in two things, he did more conſult the generoſity of his own mind, than of other mens: the one was the *largeneſs of the Revenue*, with which he would have his College at firſt indow'd: the other, that he impos'd on his Operators, a Second task of great pains, the *Education of youth*.

The laſt of theſe is indeed a matter of great weight: The Reformation of which ought to be ſeriouſly examin'd by prudent Men. For it is an undeniable Truth, which is commonly ſaid; that there would be need of fewer Laws, and leſs force to govern Men, if their Minds were rightly inform'd, and ſet ſtrait, while they were yong, and pliable. But

perhaps this labor is not ſo proper, for Experimenters to undergo: For it would not only devour too much of their Time: but it would go neer, to make them a little more *magiſterial* in Philoſophy, then became them; by being long accuſtom'd to command the opinions, and direct the manners, of their Scholars. And as to the other particular, the large eſtate, which he requir'd to the maintenance of his College: It is evident, that it is ſo difficult a thing, to draw men in to be willing to divert an antient Revenue, which had long run in another ſtream, or to contribute out of their own purſes, to the ſupporting of any new Deſign, while it ſhews nothing but promiſes, and hopes: that, in ſuch caſes, it were (it may be) more adviſable, to begin upon a ſmall ſtock, and ſo to riſe by degrees; then to profeſs great things at firſt, and to exact too much benevolence, all in one lump together. However, it was not the excellent Author's fault, that he thought better of the Age, then it did deſerve. His purpoſe in it was like himſelf, full of honor, and goodneſs: moſt of the other particulars of his draught, the *Royal Society* is now putting in practice.

I come now to the Second Period of my Narration: wherein I promis'd, to give an account of what they did, till they were publickly own'd, incourag'd, and confirm'd by Royal Favor. And I truſt, that I ſhall here produce many things, which will prove their attempts to be worthy of all Mens incouragement: though what was perform'd in this interval, may be rather ſtyl'd the *Temporary Scaffold* about the building, then the *Frame it ſelf*. But in my entrance upon this Part, being come to the top of the Hill, I begin to tremble, and to apprehend the greatneſs of my

my Subject. For I perceive that I have led my Readers Minds on, by ſo long, and ſo confident a Speech, to expect ſome wonderful Model, which ſhall far exceed all the former, that I have acknowledg'd to have been imperfect. Now, though this were really ſo, as I believe it is; yet I queſtion, how it will look, after it has been disfigur'd by my unskilful hands. But the danger of this ought to have deterr'd me in the beginning. It is now too late to look back; and I can only apply my ſelf to that *good Nature*, which a *Great Man* has obſerv'd to be ſo peculiar to our *Nation*, that there is ſcarce an expreſſion to ſignifie it, in any other Language. To this I muſt flye for ſuccor, and moſt affectionately intreat my Countrymen, that they would interpret my failings to be onely errors of obedience to ſome, whoſe commands, or deſires, I could not reſiſt: and that they would take the meaſure of the *Royal Society*, not ſo much from my lame deſcription of it; as from the honor, and reputation, of many of thoſe Men, of whom it is compos'd.

Sect. V. *A model of their Whole deſign.*

I will here, in the firſt place, contract into few Words, the whole *ſumme* of their *Reſolutions*; which I ſhall often have occaſion, to touch upon in *parcels*. Their purpoſe is, in ſhort, to make faithful *Records*, of all the Works of *Nature*, or *Art*, which can come within their reach: that ſo the preſent Age, and poſterity, may be able to put a mark on the Errors, which have been ſtrengthned by long preſcription: to reſtore the Truths, that have lain neglected: to puſh on thoſe, which are already known, to more various uſes: and to make the way more paſſable, to what remains unreveal'd. This is the compaſs of their Deſign.

Deſign. And to accompliſh this, they have indeavor'd, to ſeparate the knowledge of *Nature*, from the colours of *Rhetorick*, the devices of *Fancy*, or the delightful deceit of *Fables*. They have labor'd to inlarge it, from being confin'd to the cuſtody of a few; or from ſervitude to private intereſts. They have ſtriven to preſerve it from being over-preſs'd by a confus'd heap of vain, and uſeleſs particulars; or from being ſtraitned and bounded too much up by General Doctrines. They have try'd, to put it into a condition of perpetual increaſing; by ſettling an inviolable correſpondence between the hand, and the brain. They have ſtudi'd, to make it, not onely an Enterpriſe of one ſeaſon, or of ſome lucky opportunity; but a buſineſs of time; a ſteddy, a laſting, a popular, an uninterrupted Work. They have attempted, to free it from the Artifice, and Humors, and Paſſions of Sects; to render it an Inſtrument, whereby Mankind may obtain a Dominion over *Things*, and not onely over one anothers *Judgements*. And laſtly, they have begun to eſtabliſh theſe Reformations in Philoſophy, not ſo much, by any ſolemnity of Laws, or oſtentation of Ceremonies; as by ſolid Practice, and examples: not, by a glorious pomp of Words; but by the ſilent, effectual, and unanſwerable Arguments of real Productions.

This will more fully appear, by what I am to ſay on theſe four particulars, which ſhall make up this part of my Relation, the *Qualifications* of their *Members*: the *manner* of their *Inquiry*: their *weekly Aſſemblies*: and their *way* of *Regiſtring*.

Sect. VI. *The qualifications of the Members of the Royal Society.*

As for what belongs to the *Members* themſelves, that are to conſtitute the *Society*: It is to be noted, that

that they have freely admitted Men of different Religions, Countries, and Profeſſions of Life. This they were oblig'd to do, or elſe they would come far ſhort of the the largeneſs of their own Declarations. For they openly profeſs, not to lay the Foundation of an *Engliſh*, *Scotch*, *Iriſh*, *Popiſh*, or *Proteſtant* Philoſophy; but a Philoſophy of *Mankind*.

That the *Church of England* ought not to be apprehenſive, of this free converſe of various Judgments, I ſhall afterwards manifeſt at large. For the preſent, I ſhall franckly aſſert; that our *Doctrine*, and *Diſcipline*, will be ſo far from receiving damage by it; that it were the beſt way to make them univerſally embrac'd, if they were oftner brought to be canvas'd amidſt all ſorts of diſſenters. It is diſhonorable, to paſs a hard Cenſure on the Religions of all other Countries: It concerns them, to look to the reaſonableneſs of their Faith; and it is ſufficient for us, to be eſtabliſh'd in the Truth of our own. But yet this compariſon I may modeſtly make; that there is no one Profeſſion, amidſt the ſeveral denominations of Chriſtians, that can be expos'd to the ſearch and ſcrutiny of its adverſaries, with ſo much ſafety as ours. So equal it is, above all others, to the general Reaſon of Mankind: ſuch honorable ſecurity it provides, both for the liberty of Mens Minds, and for the peace of Government: that if ſome Mens conceptions were put in practice, that all wiſe Men ſhould have two Religions; the one, a *publick*, for their conformity with the people; the other, a *private*, to be kept to their own Breaſts: I am confident, that moſt conſidering Men, whatever their firſt were, would make ours their ſecond, if they were well acquainted with it. Seeing therefore, our Church would be in

They admit Men of all Religions.

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ſo fair a probability of gaining very much, by a frequent contention, and incounter, with other Sects: It cannot be indanger'd by this Aſſembly; which proceeds no farther, then to an unprejudic'd mixture with them.

Of all Countries. By their *naturalizing* Men of all Countries, they have laid the beginnings of many great advantages for the future. For by this means, they will be able, to ſettle a *conſtant Intelligence*, throughout all civil Nations; and make the *Royal Society* the general *Banck*, and Free-port of the World: A policy, which whether it would hold good, in the *Trade* of *England*, I know not: but ſure it will in the *Philoſophy*. We are to overcome the myſteries of all the Works of Nature; and not onely to proſecute ſuch as are confin'd to one Kingdom, or beat upon one ſhore. We ſhould not then refuſe to liſt all the aids, that will come in, how remote ſoever. If I could fetch my materials whence I pleas'd, to faſhion the *Idea* of a perfect Philoſopher: he ſhould not be all of one *clime*, but have the different excellencies of ſeveral Countries. Firſt, he ſhould have the *Induſtry*, *Activity*, and *Inquiſitive humor* of the *Dutch*, *French*, *Scotch*, and *Engliſh*, in laying the ground Work, the heap of Experiments: And then he ſhould have added the cold, and *circumſpect*, and *wary* diſpoſition of the *Italians*, and *Spaniards*, in meditating upon them, before he fully brings them into ſpeculation. All this is ſcarce ever to be found in one ſingle Man: ſeldom in the ſame Countrymen: It muſt then be ſupply'd, as well as it may, by a *Publick Council*; wherein the various diſpoſitions of all theſe Nations, may be blended together. To this purpoſe, the *Royal Society* has made no ſcruple, to receive all inquiſitive ſtrangers

ſtrangers of all Countries, into its number. And this they have conſtantly done, with ſuch peculiar reſpect, that they have not oblig'd them to the charge of contributions: they have always taken care, that ſome of their Members, ſhould aſſiſt them in interpreting all that paſs'd, in their publick Aſſemblies: and they have freely open'd their Regiſters to them; thereby inviting them, to communicate forein Rarities, by imparting their own diſcoveries. This has been often acknowledg'd, by many Learned Men, who have travell'd hither; who have been introduc'd to their meetings, and have admir'd the decency, the gravity, the plaineſs, and the calmneſs of their debates. This they have publiſh'd to the world: and this has rous'd all our neighbors to fix their eies upon *England*. From hence they expect the great improvements of knowledge will flow: and though, perhaps, they ſend their *Youth* into other parts, to learn *Faſhion*, and *Breeding*: yet their *Men* come hither for nobler ends; to be inſtructed, in the *maſculine*, and the *ſolid Arts of Life*: which is a matter of as much greater Reputation, as it is more honorable, to teach Philoſophers, than Children.

Of all Profeſſions.

By their admiſſion of Men of all *profeſſions*, theſe *two* Benefits ariſe: The *one*, that every *Art*, and every way of life already eſtabliſh'd, may be ſecure of receiving no damage by their Counſels. A thing which all new Inventions ought carefully to conſult. It is in vain, to declare againſt the profit of the moſt, in any change that we would make. We muſt not always deal with the violent current of popular paſſions; as they do with the furious *Eager* in the *Severn*: Where the ſafeſt way is, to ſet the head of the Boat directly againſt its force. But here Men muſt

follow the ſhore; wind about leiſurably; and inſinuate their uſeful alterations, by ſoft, and unperceivable degrees. From the neglect of this Prudence, we often ſee men of great Wit, to have been overborn by the multitude of their oppoſers; and to have found all their ſubtile projects too weak, for cuſtom, and intereſt: While being a little too much heated with a love of their own fancies; they have rais'd to themſelves more Enemies than they needed to have done; by defying at once, too many things in uſe. But here, this danger is very well prevented. For what ſuſpicion can *Divinity*, *Law*, or *Phyſick*, or any other courſe of life have, that they ſhall be impair'd by theſe mens labours: when they themſelves are as capable of ſitting amongſt them as any others? Have they not the ſame ſecurity that the whole Nation has for its lives and fortunes? of which this is eſteem'd the Eſtabliſhment, that men of all ſorts, and qualities, give their voice in every law that is made in *Parliament*. But the other benefit is, that by this equal Balance of all Profeſſions, there will no one particular of them overweigh the other, or make the *Oracle* onely ſpeak their *private* ſence: which elſe it were impoſſible to avoid. It is natural to all Ranks of men, to have ſome one Darling, upon which their care is chiefly fix'd. If *Mechanicks* alone were to make a Philoſophy, they would bring it all into their Shops; and force it wholly to conſiſt of Springs and Wheels, and Weights: if *Phyſicians*, they would not depart farr from their Art; ſcarce any thing would be conſider'd, beſides the *Body* of *Man*, the *Cauſes*, *Signs*, and *Cures* of Diſeaſes. So much is to be found in Men of all conditions, of that which is call'd *Pedantry* in Scholars: which is nothing elſe but an obſtinate addiction, to the

the forms of ſome private life, and not regarding general things enough. This freedom therefore, which they uſe, in embracing all aſſiſtance, is moſt advantageous to them: which is the more remarkable, in that they diligently ſearch out, and join to them, all extraordinary men, though but of ordinary Trades. And that they are likely to continue this comprehenſive temper hereafter, I will ſhew by one Inſtance: and it is the recommendation which the *King* himſelf was pleaſed to make, of the judicious Author of *the Obſervations on the Bills of Mortality:* In whoſe Election, it was ſo farr from being a prejudice, that he was a Shop-keeper of *London*; that His Majeſty gave this particular charge to His Society, that if they found any more ſuch Tradeſmen, they ſhould be ſure to admit them all, without any more ado. From hence it may be concluded, what is their inclination towards the manual Arts; by the carefull regard which their *Founder*, and *Patron*, has engag'd them to have, for all ſorts of *Mechanick Artiſts.*

Sect. VII. *It conſiſts chiefly of Gentlemen.*

But, though the *Society* entertains very many men of *particular Profeſſions*; yet the farr greater Number are *Gentlemen*, free, and unconfin'd. By the help of this, there was hopefull Proviſion made againſt *two corruptions* of Learning, which have been long complain'd of, but never remov'd: The *one*, that *Knowledge* ſtill degenerates, to conſult *preſent profit* too ſoon; the *other*, that *Philoſophers* have bin always *Maſters*, & *Scholars*; ſome impoſing, & all the other ſubmitting; and not as equal obſervers without dependence.

The advantages of this.

The firſt of theſe may be call'd, the *marrying of Arts too ſoon*; and putting them to generation, before they come to be of Age; and has been the cauſe of much

much inconvenience. It weakens their ſtrength; It makes an unhappy diſproportion in their increaſe; while not the *beſt*, but the *moſt gainfull* of them floriſh: But above all, it diminiſhes that very profit for which men ſtrive. It buſies them about poſſeſſing ſome petty prize; while Nature it ſelf, with all its mighty Treaſures, ſlips from them: and ſo they are ſerv'd like ſome fooliſh Guards; who, while they were earneſt in picking up ſome ſmall Money, that the Priſoner drop'd out of his Pocket, let the Priſoner himſelf eſcape, from whom they might have got a great randſom. This is eaſily declam'd againſt, but moſt difficult to be hindred. If any caution will ſerve, it muſt be this; to commit the Work to the care of ſuch men, who, by the freedom of their education, the plenty of their eſtates, and the uſual generoſity of Noble Bloud, may be well ſuppo'd to be moſt averſe from ſuch ſordid conſiderations.

The ſecond Error, wich is hereby endeavour'd to be remedied, is, that the Seats of Knowledg, have been for the moſt part heretofore, not *Laboratories*, as they ought to be; but onely *Scholes*, where ſome have *taught*, and all the reſt *ſubſcrib'd*. The conſequences of this are very miſchievous. For firſt, as many *Learners* as there are, ſo many hands, and brains may ſtill be reckon'd upon, as uſeleſs. It being onely the *Maſter*'s part, to examine, and obſerve; and the Diſciples, to ſubmit with ſilence, to what they conclude. But beſides this, the very inequality of the Titles of *Teachers*, and *Scholars*, does very much ſuppreſs, and tame mens Spirits; which though it ſhould be proper for Diſcipline and Education; yet is by no means conſiſtent with a free Philoſophical Conſultation. Itis undoubtedly true; that ſcarce any man's mind,

mind, is ſo capable of *thinking ſtrongly*, in the preſence of one, whom he *fears* and *reverences*; as he is, when that reſtraint is taken off. And this is to be found, not only in theſe weightier matters; but alſo (to give a lighter inſtance) in the Arts of *Diſcourſe*, & *raillery* themſelves For we have often ſeen men of bold tempers, that have over-aw'd and govern'd the Wit of moſt Companies; to have been diſturb'd, and dumb, & baſhful as children, when ſome other man has been near, who us'd to out-talk them. Such a kind of natural ſoveraignty there is, in ſome mens minds over others: which muſt needs be farr greater, when it is advanc'd by long uſe, & the venerable name of a *Maſter*. I ſhall only mention one prejudice more, & that is this; That from this onely teaching, and learning, there does not onely follow a continuance, but an increaſe of the yoak upon our Reaſons. For thoſe who take their opinions from others Rules, are commonly ſtricter Impoſers upon their Scholars, than their own Authors were on them, or than the firſt Inventors of things themſelves are upon others. Whatever the cauſe of this be; whether the firſt men are made meek, and gentle, by their long ſearch, and by better underſtanding all the difficulties of Knowledg; while thoſe that learn afterwards, onely haſtily catching things in ſmall *Syſtems*, are ſoon ſatisfy'd, before they have broken their pride, & ſo become more imperious: or, whether it ariſes from hence, that the ſame *meanneſs of Soul*, which made them bound their thoughts by others Precepts, makes them alſo *inſolent* to their inferiors; as we always find *cowards* the moſt *cruel*: or whatever other cauſe may be alleg'd; the obſervation is certain, that the *ſucceſſors* are uſually more poſitive, and Tyrannical, than the *beginners* of Sects.

If

If then there can be any cure devis'd for this; it muſt be no other, than to form an *Aſſembly* at one time, whoſe privileges ſhall be the ſame; whoſe gain ſhall be in common; whoſe *Members* were not brought up at the feet of each other. But after all, even this cannot be free from prevarication in all future Ages. So apt are ſome to diſtruſt, and others to confide too much in themſelves: ſo much ſweetneſs there is, in leading parties: ſo much pride, in following a Faction: ſuch various artifices there are, to enſnare mens *Paſſions*, and ſoon after their *Underſtandings*. All theſe hazards, and many more, are to be ſuppos'd; which it is impoſſible, for mortal Wit, wholly to foreſee, much leſs to avoid. But yet we have leſs ground of jealouſie from this Inſtitution, than any other, not only, becauſe they only deal in matters of *Fact*, which are not ſo eaſily perverted; but alſo upon ſecurity of the Inclinations of the greateſt part of the *Members* of the *Society* it ſelf. This, I hope, moſt men will acknowledg, and I will take the permiſſion, to ſay in general of them, that in all *paſt* and *preſent* times, I am confident, there can never be ſhewn, ſo great a Number of *Contemporaries*, in ſo narrow a ſpace of the World, that lov'd truth ſo zealouſly; ſought it ſo conſtantly; and upon whoſe labours, mankind might ſo freely rely. This I ſpeak, not out of Bravery to *Foreiners* (before whoſe eyes, I believe this negligent Diſcourſe will never appear) but to the learned Men of this *Nation*, who are better Judges of what I ſay. And this too, I dare affirm, in an *Age*, wherein I expect to be condemn'd of falſhood, or partiality, for this Character, which I have given. For ſo it happens, that we are now arriv'd at that exceſſive cenſuring humor, that he who takes upon him to commend any thing,

thing, though never ſo worthy, will raiſe to himſelf farr more Enemies than Friends. And indeed this *ſowrneſs* of *Criticiſm*, which now bears all down before it, is very injurious to the honour of our Countrey. For by deſpiſing men, for not being abſolutely excellent; we keep them from being ſo: while *admonitions*, join'd with *praiſes*; and *reproofs*, with *directions*; would quickly bring all things to a higher perfection. But the rudeneſs of ſuch *Criticks*, I do not ſo much regard; as the objections of ſoberer men, who have a real good will to the promotion of this deſign, and yet may be a little diſſatisfy'd in this place. For here eſpecially they may doubt of two things. The firſt, whether the *Royal Society*, being ſo numerous as it is, will not in ſhort time be diverted from its primitive purpoſe; ſeeing there wil be ſcarce enough men of Philoſophical temper always found, to fill it up; and then others will crowd in, who have not the ſame bent of mind; and ſo the whole buſineſs will inſenſibly be made, rather a matter of noiſe and pomp, than of real benefit? The ſecond, Whether their number being ſo large, will not affright private men, from imparting many profitable ſecrets to them; leſt they ſhould thereby become common, and ſo they be depriv'd of the gain, which elſe they might be ſure of, if they kept them to themſelvs.

Sect. VIII. *A defence of the largeneſs of their number.*

To the firſt, I ſhall reply, That this ſcruple is of no force, in reſpect of *the Age wherein we live*. For now the Genius of *Experimenting* is ſo much diſpers'd, that even in this *Nation*, if there were one, or two more ſuch *Aſſemblies* ſettled; there could not be wanting able men enough, to carry them on. All places and corners are now buſie, and warm about this Work: and

and we find many Noble Rarities to be every day given in, not onely by the hands of Learned and profeſs'd Philoſophers; but from the Shops of *Mechanicks*; from the Voyages of *Merchants*; from the Ploughs of *Husbandmen*; from the Sports, the Fiſh-ponds, the Parks, the Gardens of *Gentlemen*; the doubt therefore will onely touch *future Ages*. And even for them too, we may ſecurely promiſe; that they will not, for a long time, be barren of a Race of Inquiſitive minds, when the way is now ſo plainly trac'd out before them; when they ſhall have taſted of theſe firſt Fruits, and have been excited by this Example. There was ſcarce ever yet, any the meaneſt Sect, or the moſt contemptible Opinion, that was utterly extinguiſh'd in its Cradle. Whether they deſerv'd to live, or not, they all had their courſe; ſome longer, ſome ſhorter; according as they could combine with the Intereſts, or affections, of the Countreys where they began. What reaſon then have we to bode ill alone to this *Inſtitution*; which is now ſo earneſtly embrac'd; and which, the older it grows, cannot but ſtill appear more inoffenſive? If we onely requir'd *perfect Philoſophers*, to manage this employment, it were another caſe. For then I grant it were improbable, that threeſcore, or an hundred ſuch ſhould meet in one time. But here it is far otherwiſe. If we cannot have a ſufficient choice of thoſe that are ſkill'd in all *Divine* and *human* things (which was the antient definition of a Philoſopher) it ſuffices, if many of them be plain, diligent, and laborious obſervers: ſuch, who, though they bring not much knowledg, yet bring their hands, and their eyes uncorrupted: ſuch as have not their Brains infected by falſe Images; and can honeſtly aſſiſt in the *examining*, and *Regiſtring* what

what the others repreſent to their view. It ſeems ſtrange to me, that men ſhould conſpire, to believe all things more perplex'd, and difficult, than indeed they are. This may be ſhewn in moſt other matters; but in this particular in hand, it is moſt evident. Men did generally think, that no man was fit to meddle in matters of this conſequence, but he that had bred himſelf up in a long courſe of Diſcipline for that purpoſe; that had the habit, the geſture, the look of a Philoſopher. Whereas experience on the contrary tells us, that greater things are produc'd, by the *free* way, than the *formal*. This miſtake may well be compar'd, to the conceit we had of *Souldiers*, in the beginning of the civil Warrs. None was thought worthy of that name, but he that could ſhew his wounds, and talk aloud of his exploits in the *Low-Countreys*. Whereas the whole buſineſs of fighting, was afterwards chiefly perform'd by *untravell'd Gentlemen*, *raw Citizens*, and *Generals*, that had ſcarce ever before ſeen a Battel. But to ſay no more, it is ſo farr from being a blemiſh; that it is rather the excellency of this Inſtitution, that *men of various Studies* are introduc'd. For ſo there will be always many ſincere witneſſes ſtanding by, whom ſelf-love wil not perſuade to report falſly, nor heat of invention carry to ſwallow a deceit too ſoon; as having themſelves no hand in the making of the Experiment, but onely in the *Inſpection*. So cautious ought men to be, in pronouncing even upon Matters of Fact. The whole care is not to be truſted to *ſingle* men: not to a *Company* all of *one mind*; not to *Philoſophers*; not to *devout*, and religious men *alone*: By all theſe we have been already deluded; even by thoſe whom I laſt nam'd, who ought moſt of all to abhorr falſhood; of whom yet many have mul-

tiply'd upon us, infinite Stories, and falſe Miracles, without any regard to Conſcience, or Truth.

To the ſecond Objection I ſhall briefly anſwer; that if all the Authors, or Poſſeſſors of extraordinary inventions, ſhould conſpire to conceal all, that was in their power, from them; yet the *Method*, which they take, will quickly make abundant reparation for that defect. If they cannot come at Nature in its particular *Streams*, they will have it in the *Fountain*. If they could be ſhut out from the Cloſets of *Phyſicians*, or the Work-houſes of *Mechanicks*; yet with the ſame, or with better ſorts of Inſtruments, on more materials, by more hands, with a more rational light, they would not onely reſtore again the old Arts, but find out, perhaps, many more of farr greater importance. But I need not lay much treſs upon that hope; when there is no queſtion at all, but all, or the greateſt part of ſuch *Domeſtick Receipts*, and Curioſities, will ſoon flow into this *publick Treaſure*. How few ſecrets have there been, though never ſo gainful, that have been long conceal'd from the whole World by their *Authors*? Were not all the leaſt Arts of life at firſt private? Were not *Watches*, or *Locks*, or *Guns*, or *Printing*, or lately the *Bow-dye*, devis'd by *particular men*, but ſoon made *common*? If neither *chance*, nor *friendſhip*, nor *Treachery* of ſervants, have brought ſuch things out; yet we ſee *oſtentation* alone, to be every day powerful enough to do it. This deſire of glory, and to be counted *Authors*; prevails on all, even on many of the dark and reſerv'd *Chymiſts* themſelves: who are ever printing their greateſt myſteries; though indeed they ſeem to do it, with ſo much reluctancy, and with a willingneſs to hide ſtill; which makes their *ſtyle* to reſemble the *ſmoak*, in which they deal

deal. Well then, if this diſpoſition be ſo *univerſal*; why ſhould we think, that the Inventors, will be only tender, and backward to the *Royal Society*? From which they will not only reap the moſt *ſolid honor*; but will alſo receive the ſtrongeſt aſſurances, of ſtill retaining the *greateſt part of the profit?* But if all this ſhould fail; there ſtill remains a refuge, which will put this whole matter out of diſpute: and that is, that the *Royal Society* will be able by degrees, to purchaſe ſuch extraordinary inventions, which are now cloſe lock'd up in *Cabinets*; and then to bring them into one common Stock, which ſhall be upon all occaſions expos'd to all mens uſe. This is a moſt *heroick Invention*: For by ſuch concealments, there may come very much hurt to mankind. If any certain remedy ſhould be found out againſt an *Epidemical* diſeaſe; if it were ſuffer'd to be ingroſs'd by one man, there would be great ſwarms ſwept away, which otherwiſe might be eaſily ſav'd. I ſhall inſtance in the *Sweating-Sickneſs*. The *Medicine* for it was almoſt infallible: But, before that could be generally publiſh'd, it had almoſt diſpeopl'd whole Towns. If the ſame diſeaſe ſhould have return'd, it might have been again as deſtructive, had not the *Lord Bacon* taken care, to ſet down the particular courſe of *Phyſick* for it, in his Hiſtory of *Henry the Seventh*, and ſo put it beyond the poſſibility of any private man's invading it. This ought to be imitated in all other *ſoveraign cures* of the like nature, to avoid ſuch dreadful caſualties. The *Artificers* ſhould reap the common crop of their *Arts*: but the *publick* ſhould ſtill have *Title* to the miraculous productions. It ſhould be ſo appointed, as it is in the profits of mens Lands: where the Corn, and Graſs, and Timber, and ſome courſer Metals belong to the

owner: But the *Royal Mines*, in whoſe ground ſoever they are diſcover'd, are no man's propriety, but ſtill fall to the *Crown*.

Theſe therefore are the *Qualities*, which they have principally requir'd, in thoſe, whom they admitted: ſtill reſerving to themſelves a power of *increaſing*, or keeping to their number, as they ſaw occaſion. By this means, they have given aſſurance of an eternal quietneſs, and moderation, in their experimental progreſs; becauſe they allow themſelves to differ in the weightieſt matter, even in the *way of Salvation* it ſelf. By this they have taken care, that nothing ſhall be ſo remote, as to eſcape their reach: becauſe ſome of their *Members* are ſtill ſcattered abroad, in moſt of the habitable parts of the Earth. By this, they have provided, that no profitable thing ſhall ſeem too mean for their conſideration, ſeeing they have ſome amongſt them, whoſe life is employ'd about *little* things, as well as *great*. By this they have broken down the partition wall, and made a fair entrance, for *all conditions of men* to engage in theſe Studies; which were heretofore affrighted from them, by a groundleſs apprehenſion of their chargeableneſs, and difficulty. Thus they have form'd that *Society*, which intends a *Philoſophy*, for the uſe of *Cities*; and not for the retirements of *Schools*, to reſemble the *Cities* themſelves: which are compounded of all ſorts of men, of the *Gown*, of the *Sword*, of the *Shop*, of the *Field*, of the *Court*, of the *Sea*; all mutually aſſiſting each other.

Sect. IX. *Their courſe of Inquiry.*

Let us next conſider what *courſe of Inquiry* they take, to make all their Labours unite for the ſervice of man-kind: And here I ſhall inſiſt on their *Expence*, their

their *Inſtruments*, their *Matter*, and their *Method*.

Of the Stock, upon which their *Expence* has been hitherto defraid, I can ſay nothing, that is very *magnificent:* ſeeing they have rely'd upon no more than ſome ſmall *Admiſſion-money*, and *weekly Contributions* amongſt themſelves. Such a *Revenue* as this, can make no great ſound, nor amount to any *vaſt ſumm*. But yet, I ſhall ſay this for it, that it was the onely way, which could have been begun, with a ſecurity of ſucceſs, in that condition of things. The *publick Faith* of *Experimental Philoſophy*, was not then ſtrong enough, to move Men and Women of all conditions, to bring in their Bracelets and Jewels, towards the carrying of it on. Such affections as thoſe may be rais'd by a miſ-guided zeal; but ſeldom, or never, by calm and unpaſſionate Reaſon. It was therefore well ordain'd, that the firſt Benevolence ſhould come from the *Experimenters themſelves*. If they had ſpeedily at firſt call'd for *mighty Treaſures*; and ſaid aloud, that their Enterpriſe requir'd the *Exchequer of a Kingdom*; they would onely have been contemn'd, as vain *Projectors*. So ready is man-kind, to ſuſpect all new undertakings to be Cheats, and *Chimæraes*; eſpecialy, when they ſeem *chargeable*: that it may be, many excellent things have been loſt by that jealouſie. Of this we have a fatal Inſtance amongſt our ſelves. For it was this fear of being circumvented, that made one of our wiſeſt *Kings* delay *Columbus* too long, when he came with the promiſe of a *new World:* whereas a little more confidence in his *Art*, and a ſmall charge in furniſhing out ſome few Ships, would have yearly brought all the Silver of the *Weſt-Indies* to *London*, which now arrives at *Sevill*.

Their Expence.

This ſuſpicion, which is ſo natural to mens breaſts, could

could not any way harm the *Royal Societies* eſtabliſhment: ſeeing its firſt claims, and pretenſions were ſo modeſt. And yet I ſhall preſume to aſſure the World; that what they ſhall raiſe on theſe mean Foundations, will be more anſwerable to the *largeneſs* of their intentions, than to the *narrowneſs* of their beginnings. This I ſpeak ſo boldly, not onely becauſe it is almoſt generally found true; that thoſe things, which have been *ſmall* at firſt, have oftener grown *greater*, than thoſe which have begun upon a *wider* bottom, which have commonly *ſtood at a ſtay:* But alſo in reſpect of the preſent prevailing *Genius* of the *Engliſh* Nation. It is moſt uſually found, that every People, has ſome one ſtudy or other in their view, about which their minds are moſt intent, and their Purſes readier to open. This is ſometimes a profuſion in *Habit*, and *Dyet*; ſometimes *Religious Buildings*; and ſometimes the *Civil Ornaments* of their Cities, and Country. The firſt of theſe will ſhortly vaniſh from amongſt us, by the irreſiſtible correction of the King's own example: the *next* is of late years very ſenſibly abated: and it is the *laſt* of the three towards which mens deſires are moſt propenſe. To evidence this; I think it may be calculated, that ſince the *Kings* Return, there have been more *Acts* of *Parliament*, for the *clearing* and *beautifying* of Streets, for the *repayring* of *Highwayes*, for the *cutting* of *Rivers*, for the *increaſe* of *Manufactures*, for the ſetting on foot the Trade of Fiſhing, and many other ſuch Publick Works, to adorn the State; than in divers Ages before. This *General Temper* being well weigh'd; it cannot be imagin'd, that the *Nation* will withdraw its aſſiſtance from the *Royal Society* alone; which does not intend to ſtop at ſome *particular benefit*, but goes to the root of

of *all noble Inventions*, and propoſes an infallible courſe to make *England* the glory of the Weſtern world.

This my Love, and my Hopes prompt me to ſay. But beſides this, there is one thing more, that perſuades me, that the *Royal Society* will be *Immortal*. And that is, that if their Stock ſhould ſtill continue narrow, yet even upon that, they will be able to free themſelves from all difficulties, and to make a conſtant increaſe of it, by their managing. There is ſcarce any thing, has more hindred the *True Philoſophy*; than a vain opinion, that men have taken up, that nothing could be done in it, to any purpoſe, but upon a *vaſt charge*, and by a *mighty Revenue*. Men commonly think, that the *pit*, in which (according to *Democritus*) Truth lyes hid, is bottomleſs: and that it will devour whatever is thrown into it, without being the fuller. This falſe conception had got ſo much ground, that aſſoon as a man began to put his hands to *Experiments*, he was preſently given over, as impoveriſh't and undone. And indeed the Enemies of Real Knowledge, had ſome appearance of Reaſon to conclude this heretofore: becauſe they had ſeen the great Eſtates of ſome *Chymiſts* melted away, without any thing left behind, to make recompence. But this imagination can now no longer prevail. Men now underſtand, that Philoſophy needs not ſo great a prodigality to maintain it: that the moſt *profitable* Tryals are not always the moſt *coſtly*: that the beſt Inventions have not been found out by the *richeſt*, but by the moſt *prudent*, and *Induſtrious* Obſervers: that the right *Art* of *Experimenting*, when it is once ſet forward, will go near to ſuſtain it ſelf. This I ſpeak, not to ſtop mens future Bounty, by a Philoſophical Boaſt, that

that the *Royal Society* has enough already: But rather to encourage them to caſt in more help; by ſhewing them, what return may be made from a little, by a wiſe adminiſtration.

Sect. X. *Their Inſtruments.*

Of the variety, and excellence of the *Inſtruments*, which it lyes in their power to uſe; I will give no other proof, then the wonderfull perfection to which all Manual Arts have of late years arriv'd. Men now generally underſtand, to employ thoſe very Tools which the *Antients* lent us, to infinite more Works, than formerly: they have alſo *of late* devis'd a great multitude of all ſorts, which were before *unknown*: and beſides, we may very well expect, that time will every day bring forth *more*. For, according as the *matter* to work upon does abound, the greater plenty of *Inſtruments*, muſt by conſequence follow: ſuch a connexion there is between *Inventions*, and the *means* of Inventing, that they mutually increaſe each other.

I might be as large, as I pleas'd, in this particular; in running through ſome part of all the Innumerable Arts of the *Weſtern world*; and it were not difficult to ſhew, that the ordinary ſhops of *Mechanicks*, are now as full of *rarities*, as the *Cabinets* of the former *nobleſt Mathematicians*. But I will leave that ſubject, which is ſo familiar to all; and chooſe rather, to fetch a confirmation of this, even from thoſe Countreys, which (after the manner of the *Antients*) we call *Barbarous*. And in going thither for an example, I have a farther end. In my foregoing diſcourſe, I try'd to make out the advantages of the *Moderne* Times, above the *antient*; by following the progreſs of Learning, down through their tracks, to which *Scholars*

lars uſually confine it; I will now alſo ſtrengthen that argument; by briefly comparing the ſkill, and the works of the *unlearned* parts of the *preſent* world, with thoſe that are *paſt*. The antient *Barbarians* then, thoſe *Nations* I mean, who lay without the circle of thoſe Arts which we admire; the *Gaules*, the *Britains*, the *Germans*, the *Scythians*, have ſcarce left any foot-ſteps behind them, to ſhew that they were rational men. Moſt of them were ſavage in their *practices*; groſs in their *contrivances*; ignorant of all, that might make life either ſafe, or pleaſant. Thus it was with them, and this all Hiſtory ſpeaks with one voice: whereas the *Barbarians* of our Times (if I may take the liberty ſtill to uſe that word, which the pride of *Greece* firſt brought into faſhion) the *Turks*, the *Moors*, the *Eaſt-Indians*, and even the *Americans*, though they too are utterly unacquainted with all our Sciences; yet by the help of an *Univerſal Light*, which ſeems to overſpread this *Age*, are in ſeveral *Handicrafts* moſt ready, and dextrous: inſomuch that in ſome, they can ſcarce be imitated by the *Europeans* themſelves. I ſhall leave it to any man, to conjecture from hence, which of theſe two times has the Prerogative; and how much better helps are probably to be found at this day, in the moſt *Civil Countries*: when we now find ſo much artifice, amongſt thoſe our *Contemporaries*, who only follow *rude*, and *untaught* Nature.

Sect. XI. *Their matter.*

Of the *extent* of the *matter*, about which they have been already converſant, and intend to be hereafter; there can be no better meaſure taken, than by giving a *general proſpect* of all the objects of mens thoughts: which can be nothing elſe, but either *God*, or *Men*, or *Nature*.

As for the Firſt, they meddle no otherwiſe with *Divine things*, than onely as the *Power*, and *Wiſdom*, and *Goodneſs* of the *Creator*, is diſplay'd in the admirable order, and workman-ſhip of the Creatures. It cannot be deny'd, but it lies in the *Natural Philoſophers* hands, beſt to advance that part of *Divinity*: which, though it fills not the mind, with ſuch *tender*, and *powerful contemplations*, as that which ſhews us Man's *Redemption* by a *Mediator*; yet it is by no means to be paſs'd by unregarded: but is an excellent ground to eſtabliſh the other. This is *a Religion*, which is confirm'd, by the unanimous agreement of all ſorts of Worſhips: and may ſerve in reſpect to *Chriſtianity*, as *Solomon*'s Porch to the *Temple*; into the one the *Heathens* themſelvs did alſo enter; but into the other, onely God's *peculiar People*.

In men, may be conſider'd the *Faculties*, and operations of their *Souls*; The *conſtitution of their Bodies*, and the *works of their Hands*. Of theſe, the *firſt* they omit: both becauſe the knowledg and direction of them have been before undertaken, by ſome *Arts*, on which they have no mind to intrench; as the *Politicks*, *Morality*, and *Oratory*: and alſo becauſe the *Reaſon*, the *Underſtanding*, the *Tempers*, the *Will*, the *Paſſions* of Men, are ſo hard to be reduc'd to any certain obſervation of the *ſenſes*; and afford ſo much room to the *obſervers* to falſifie or counterfeit: that if ſuch diſcourſes ſhould be once entertain'd; they would be in danger of falling into *talking*, inſteed of *working*, which they carefully avoid. Such ſubjects therefore as theſe, they have hitherto kept out. But yet, when they ſhall have made more progreſs, in *material* things, they will be in a condition, of pronouncing more boldly on them too. For, though Man's *Soul*,

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and *Body* are not onely one *natural Engine* (as ſome have thought) of whoſe motions of all ſorts, there may be as certain an accompt given, as of thoſe of a Watch or Clock: yet by long ſtudying of the *Spirits*, of the *Bloud*, of the *Nouriſhment*, of the parts, of the *Diſeaſes*, of the *Advantages*, of the accidents which belong to *humane bodies* (all which will come within their Province) there, without queſtion, be very neer gheſſes made, even at the more *exalted*, and *immediate* Actions of the *Soul*; and that too, without deſtroying its *Spiritual* and *Immortal* Being.

Theſe two Subjects, *God*, and the *Soul*, being onely forborn: In all the reſt, they wander, at their pleaſure: In the frame of *Mens bodies*, the ways for ſtrong, healthful, and long life: In the *Arts of Mens Hands*, thoſe that either *neceſſity*, *convenience*, or *delight* have produc'd: In the *works* of *Nature*, their helps, their varieties, redundancies, and defects: and in bringing all theſe to the *uſes* of *humane Society*.

Sect. XII. *Their Method of Inquiry.*

In their *Method* of *Inquiring*, I will obſerve, how they have behav'd themſelves, in things that might be brought within their *own Touch and Sight*: and how in thoſe, which are ſo remote, and hard to be come by, that about them, they were forc'd to truſt *the reports of others*.

In the firſt kind: I ſhall lay it down, as their *Fundamental Law*, that whenever they could poſſibly get to *handle* the ſubject, the *Experiment* was ſtill perform'd by ſome of the *Members* themſelves. The want of this *exactneſs*, has very much diminiſh'd the credit of former *Naturaliſts*. It might elſe have ſeem'd ſtrange, that ſo many men of Wit, ſetting ſo many hands on work; being ſo watchful to catch up all re-

lations, from Woods, Fields, Mountains, Rivers, Seas, and Lands; and ſcattering their Penſions ſo liberally; ſhould yet be able to collect ſo few Obſervations, that have been judicious or uſeful. But the Reaſon is plain; for while they thought it enough, to be onely *Receivers* of others Intelligence; they have either employ'd *Ignorant* ſearchers, who knew not how to digeſt or diſtinguiſh what they found: or *frivolous*, who always lov'd to come home laden, though it were but with trifles: or (which is worſt of all) *crafty*, who having perceiv'd the humours of thoſe that paid them ſo well, would always take care to bring in ſuch collections as might ſeem to agree with the Opinions and Principles of their *Maſters*, however they did with *Nature* it ſelf.

This Inconvenience, the *Royal Society* has eſcap'd, by making the whole proceſs paſs under its own eyes. And the Task was divided amongſt them, by one of theſe two ways. Firſt, it was ſometimes referr'd to ſome *particular men*, to make choice of what *Subject* they pleaſed, and to follow their own humour in the *Trial*; the *expence* being ſtill allow'd from the general Stock. By which liberty, that they afforded, they had a very neceſſary regard to the power of *particular Inclinations*: which in all ſorts of *Knowledg* is ſo ſtrong; that there may be numberleſs Inſtances given of men, who in ſome things have been altogether *uſeleſs*, and yet in others have had ſuch a vigorous, and *ſucceſsful* faculty, as if they had been born, and form'd for them alone.

Or elſe ſecondly, the *Society* it ſelf made the diſtribution, and deputed whom it thought fit for the proſecution of ſuch, or ſuch Experiments. And this they did, either by allotting the *ſame Work* to *ſeveral* men,

men, ſeparated one from another; or elſe by *joyning* them into *Committees* (if we may uſe that word in a Philoſophical ſence, and ſo in ſome meaſure purge it from the ill ſound, which it formerly had) By this *union* of *eyes*, and *hands*, there do theſe *advantages* ariſe. Thereby there will be a full *comprehenſion* of the object in *all* its appearances; and ſo there will be a mutual communication of the light of one *Science* to another: whereas *ſingle labours* can be but as a proſpect taken upon one ſide. And alſo by this fixing of ſeveral mens thoughts upon one thing, there will be an excellent cure for that *defect*, which is almoſt unavoidable in great *Inventors*. It is the cuſtom of ſuch earneſt, and powerful minds, to do wonderful things in the *beginning*; but ſhortly after, to be overborn by the multitude, and weight of their own thoughts; then to yield, and cool by little and little; and at laſt grow weary, and even to loath that, upon which they were at firſt the moſt eager. This is the wonted conſtitution of *great Wits:* ſuch tender things, are thoſe exalted Actions of the mind; and ſo hard it is, for thoſe imaginations, that can run ſwift, and mighty Races, to be able to travel a long, and a conſtant journey. The effects of this infirmity have been ſo remarkable, that we have certainly loſt very many *Inventions*, after they have been in part faſhion'd, by the meer *languiſhing*, and *negligence* of their *Authours*. For this, the beſt proviſion muſt be, to join many men together; for it cannot be imagin'd, that they ſhould be all ſo violent, and fiery: and ſo by this mingling of Tempers, the *Impetuous* men, not having the whole burthen on them, may have leiſure for intervals to recruit their firſt heat; and the more *judicious*, who are not ſo ſoon poſſeſs'd with ſuch raptures, may carry

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on the others ſtrong conceptions, by ſoberer degrees, to a full accompliſhment.

Sect XIII. *Their way of Inquiry into remote matters.*

This they have practis'd in ſuch things, whereof the matter is common; and wherein they may repeat their labours as they pleaſe. But in *forein*, and *remote* affairs, their *Intentions*, and their *Advantages* do farr exceed all others. For theſe, they have begun to ſettle a *correſpondence* through all Countreys; and have taken ſuch order, that in ſhort time, there will ſcarce a Ship come up the *Thames*, that does not make ſome return of *Experiments*, as well as of *Merchandize*.

This their care of an *Univerſal Intelligence*, is befriended by *Nature* its ſelf, in the ſituation of *England*: For, lying ſo, as it does, in the paſſage between the *Northern* parts of the World, and the *Southern*; its *Ports* being open to all Coaſts, and its *Ships* ſpreading their Sails in all Seas; it is thereby neceſſarily made, not onely *Miſtreſs* of the *Ocean*, but the moſt proper *Seat*, for the advancement of *Knowledg*. From the *poſitions* of Countreys, ariſe not only their ſeveral ſhapes, manners, cuſtoms, colours, but alſo their *different Arts*, and *Studies*. The *Inland* and *Continent*, we ſee do give Laws, to Diſcourſe, to Habits, to Behaviour: but thoſe that border upon the *Seas*, are moſt properly ſeated, to bring home matter for *new Sciences*, and to make the ſame proportion of Diſcoveries above others, in the *Intellectual* Globe, as they have done in the *Material*.

Upon this advantage of our Iſland, there is ſo much ſtreſs to be laid, towards the proſperity of this Deſign; that if we ſhould ſearch through all the World, for a perpetual habitation, wherein the Univerſal Philoſophy might ſettle it ſelf; there can none be found, which

which is comparable to *London*, of all the former, or preſent Seats of Empire. *Babylon*, that was the *Capital City* of the firſt *Monarchy*, was ſituated in a Champion Countrey, had a clear, and uncloudy air; and was therefore fit enough to promote one part of *Natural Knowledg*, the *Obſervations* of the *Heavens*: But it was a Mid-land Town, and regarded not the Traffique of Foreiners; abounding with its own luxury, and riches. *Memphis* was improper, upon the ſame accompt; for *Egypt* was a *Land content with its own plenty*; admitting ſtrangers, rather to inſtruct them, than to learn any thing from them. *Carthage* ſtood not ſo well for a reſort for *Philoſophers*, as for *Pirats*; as all the *African* ſhore continues at this day. As for *Rome*, its Fortune was read by *Virgil*; when he ſaid, that *it only ought to excel in the Arts of Ruling*. *Conſtantinople*, though its preſent *Maſters* were not *Barbarous*, yet is too much ſhut up by the Straits of *Helleſpont*. *Vienna* is now a Frontier Town, and has no communication with the *Ocean*, but by a long compaſs about. *Amſterdam* is a place of Trade, without the mixture of men of freer thoughts. And, even *Paris* it ſelf, though it is far to be preferr'd before all the others for the reſort of Learned and Inquiſitive men to it, yet is leſs capable, for the ſame reaſons, for which *Athens* was, by being the Seat of *Gallantry*, the *Arts of ſpeech*, and *education*. But it is *London* alone, that enjoys moſt of the others advantages, without their inconveniences. It is the head of a *mighty Empire*, the greateſt that ever commanded the *Ocean*: It is compos'd of *Gentlemen*, as well as *Traders*: It has a large intercourſe with all the *Earth*: It is, as the *Poets* deſcribe their *Houſe* of *Fame*, a City, where all the noiſes and buſineſs in the World do meet: and therefore this

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honor is juſtly due to it, to be the *conſtant* place of *reſidence* for that *Knowledg*, which is to be made up of the Reports, and Intelligence of all Countreys.

To this I will adde; That we have another help in our hands, which almoſt forces this Crown on the head of the *Engliſh* Nation: and that is, the *Noble*, and *Inquiſitive Genius* of our *Merchants*. This cannot be better ſhewn, than by comparing them, with thoſe of that one Countrey; which onely ſtands in competition with us for Trade. The *Merchants* of *England* live honourably in forein parts; thoſe of *Holland* meanly, minding their gain alone: ours converſe freely, and learn from all; having in their behaviour, very much of the *Gentility* of the Families, from which ſo many of them are deſcended: The others, when they are abroad, ſhew, that they are onely a Race of plain *Citizens*, keeping themſelves moſt within their own Cells, and Ware-houſes; ſcarce regarding the acquaintance of any, but thoſe, with whom they traffick. This *largeneſs* of ours, and *narrowneſs* of their living, does, no doubt, conduce very much to inrich them; and is, perhaps, one of the Reaſons, that they can ſo eaſily under-ſel us: But withall, it makes ours the moſt *capable*, as theirs *unfit*, to promote ſuch an *Enterpriſe*, as this of which I am now ſpeaking. For indeed, the effects of their ſeveral ways of life, are as different: of the *Hollanders*, I need ſay no more: But of the *Engliſh Merchants* I will affirm, that in all ſorts of Politeneſs, and ſkill in the *World*, and *humane affairs*, they do not onely excel them, but are equal to any other ſort of men amongſt us.

This I have ſpoken, not to leſſen the reputation of that *Induſtrious People*: But, that I might (if it were poſſible) inflame their minds to an emulation of this Deſign.

Deſign. They have all things imaginable to ſtirr them up: they have the Examples of the greateſt *Wits* of other Countreys, who have left their own homes, to retire thither, for the freedom of their Philoſophical Studies: they have one place (I mean the *Hague*) which may be ſoon made the very Copy of a Town in the *New Atlantis*; which for its pleaſantneſs, and for the concourſe of men of all conditions to it, may be counted above all others (except *London*) the moſt advantagiouſly ſeated for this ſervice.

Theſe have been the privileges and practices of the *Royal Society*, in things forein, & Native. It would now be needleſs to ſet down all the ſteps of their progreſs about them; how they obſerv'd all the varieties of *Generations*, and *corruptions*, natural, and artificial; all the increaſings, and leſſenings; agreements, and oppoſitions of things; how, having found out a *cauſe*, they have apply'd it to many other *effects*: and the *effects* to different *cauſes*; how they are wont to change the Inſtruments and places, and quantities of matter, according to occaſions: and all the other ſubtilties, and windings of Trial, which are almoſt infinite to expreſs. I ſhall onely, in paſſing, touch on theſe two things, which they have moſt carefully conſulted.

The one is, not to preſcribe to themſelves, any certain *Art* of *Experimenting*, within which to circumſcribe their thoughts: But rather to keep themſelves free, and change their courſe, according to the different circumſtances, that occurr to them in their operations; and the ſeveral alterations of the Bodies, on which they work. The true *Experimenting* has this one thing inſeparable from it, never to be a *fix'd* and *ſettled Art*, and never to be *limited* by conſtant Rules. This, perhaps, may be ſhewn too in other *Arts*; as in

that of *Invention*, of which, though in *Logick*, and *Rhetorick*, ſo many bounds, and helps are given: yet I believe very few have argued or diſcourſed by thoſe *Topicks*. But whether that be unconfin'd, or no, it is certain, that *Experimenting* is; like that which is call'd *Decence* in humane life; which, though it be that, by which all our Actions are to be faſhion'd; and though many things may be plauſibly ſaid upon it; yet it is never wholly to be reduc'd to *ſtanding Precepts*; and may almoſt as eaſily be *obtain'd*, as defin'd.

Their other care has been, to regard the *leaſt*, and the *plaineſt* things, and thoſe that may appear at *firſt* the moſt *inconſiderable*; as well as the *greateſt Curioſities*. This was viſibly neglected by the *Antients*. The *Hiſtories* of *Pliny*, *Ariſtotle*, *Solinus*, *Ælian*, abounding more with pretty Tales, and fine monſtrous Stories; than ſober, and fruitful Relations. If they could gather together ſome extraordinary Qualities of *Stones*, or *Minerals*, ſome Rarities of the *Age*, the *food*, the *colour*, the *ſhapes* of *Beaſts*, or ſome *vertues* of *Fountains*, or *Rivers*: they thought, they had perform'd the chiefeſt part of *Natural Hiſtorians*. But this courſe is ſubject to much corruption. It is not the true following of *Nature*; For that ſtill goes on in a ſteddy Rode, nor is it ſo extravagant, and ſo artificial in its contrivances, as our admiration, proceeding from our ignorance, makes it. It is alſo a way that of all others, is moſt ſubject to be deceiv'd: For it will make men inclinable to bend the Truth much awry, to raiſe a ſpecious Obſervation out of it. It ſtops the ſevere progreſs of *Inquiry*: Infecting the mind, and making it averſe from the true *Natural Philoſophy*: It is like *Romances*, in reſpect of *True Hiſtory*; which,

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by multiplying varieties of extraordinary Events, and ſurprizing circumſtances, makes that ſeem dull, and taſtleſs. And, to ſay no more, the very delight which it raiſes, is nothing ſo ſolid: but, as the ſatisfaction of *Fancy*, it affects us a little, in the beginning, but ſoon wearies, and ſurfets: whereas a juſt *Hiſtory* of *Nature*, like the pleaſure of *Reaſon*, would not be, perhaps, ſo quick and violent, but of farr longer continuance, in its contentment.

Sect. XIV. *Their weekly Aſſemblies.*

Their *Matter*, being thus collected, has been brought before their *weekly meetings*, to undergo a juſt and a full examination. In them their principal endeavours have been, that they might enjoy the benefits of a *mix'd Aſſembly*, which are largeneſs of Obſervation, and diverſity of Judgments, without the miſchiefs that uſually accompany it, ſuch as confuſion, unſteddineſs, and the little animoſities of divided Parties. That they have avoided theſe dangers for the time paſt; there can be no better proof, than their conſtant practice; wherein they have perpetually preſerv'd a ſingular ſobriety of debating, ſlowneſs of conſenting, and moderation of diſſenting. Nor have they been onely free from *Faction*, but from the very *Cauſes*, and *beginnings* of it. It was in vain for any man amongſt them to ſtrive to preferr himſelf before another; or to ſeek for any great glory from the ſubtilty of his Wit; ſeeing it was the inartificial proceſs of the *Experiment*, and not the *Acuteneſs* of any Commentary upon it, which they have had in veneration. There was no room left, for any to attempt, to heat their own, or others minds, beyond a due temper; where they were not allow'd to expatiate, or amplifie, or connect ſpecious arguments together.

They could not be much exaſperated one againſt another in their diſagreements, becauſe they acknowledg, that there may be ſeveral Methods of Nature, in producing the ſame thing, and all equally good: whereas they that contend for truth by talking, do commonly ſuppoſe that there is but one way of finding it out. The differences which ſhould chance to happen, might ſoon be compos'd; becauſe they could not be grounded on matters of ſpeculation, or opinion, but onely of ſence; which are never wont to adminiſter ſo powerful occaſions of diſturbance, and contention, as the other. In brief, they have eſcap'd the prejudices that uſe to ariſe from Authority, from unequality of Perſons, from inſinuations, from friendſhips; But above all, they have guarded themſelves againſt themſelves, leſt the ſtrength of their own thoughts ſhould lead them into error; leſt their good Fortune in one Diſcovery, ſhould preſently confine them onely to one way of trial; leſt their failings ſhould diſcourage, or their ſucceſs abate their diligence. All theſe *excellent Philoſophical Qualities*, they have by long cuſtom, made to become the peculiar Genius of this *Society:* and to deſcend down to their ſucceſſors, not onely as *circumſtantial Laws*, which may be neglected, or alter'd in the courſe of time; but as the very *life* of their conſtitution; to remain on their minds, as the *laws* of *Nature* do in the hearts of Men; which are ſo near to us, that we can hardly diſtinguiſh, whether they were taught us by degrees, or rooted in the very foundation of our Being.

Sect. XV. *The Ceremonies of their meetings.*

It will not be here ſeaſonable, to ſpeak much, of the *Ceremonies* which they have hitherto obſerv'd in theſe *Meetings*; becauſe they are, almoſt, the ſame, which

which have been ſince eſtabliſh'd by their *Council*, which we ſhall have a more proper occaſion to produce hereafter. Let this onely be ſaid in brief, to ſatisfie the curious.

The *Place* where they hitherto aſſembled, is *Greſham-College*; where, by the munificence of a Citizen, there have been Lectures for ſeveral *Arts* indow'd ſo liberally, that if it were beyond Sea, it might well paſs for an *Univerſity*. And indeed, by a rare happineſs in the conſtitution (of which I know not where to find the like example) the Profeſſors have been from the beginning, and chiefly, of late years, of the moſt Learned Men of the Nation; though the choice has been wholly in the diſpoſal of Citizens. Here the *Royal Society* has one *publick Room* to meet in, another for a *repoſitory* to keep their Inſtruments, Books, Rarities, Papers, and whatever elſe belongs to them: making uſe beſides, by permiſſion, of ſeveral of the other Lodgings, as their occaſions do require. And, when I conſider the place it ſelf; me thinks it bears ſome likeneſs to their Deſign; It is now a *College*, but was once the Manſion-houſe of one of the *greateſt Merchants*, that ever was in *England*: And ſuch a *Philoſophy* they would build; which ſhould firſt wholly conſiſt of *Action*, and *Intelligence*, before it be brought into *Teaching*, and *Contemplation*.

There Time is every *Wedneſday*, after the Lecture of the *Aſtronomy* Profeſſor; perhaps, in memory of the firſt occaſions of their Rendezvouſes.

Their *Elections*, perform'd by *Ballotting*; every member having a Vote; the Candidates being nam'd at one meeting, and put to the *ſcrutiny* at another.

Their *Chief Officer*, is the *Preſident*; to whom it belongs to call, and diſſolve their *meetings*; to *propoſe* the

the Subject; to *regulate* the Proceedings; to *change* the Inquiry from one thing to another; to *admit* the Members who are elected.

Beſides him, they had at firſt a *Regiſter*, who was to take Notes of all that paſs'd; which were afterwards to be reduc'd into their *Journals*, and *Regiſter Books*. This Task was firſt *perform'd* by Dr. *Croone*. But they ſince thought it more neceſſary, to appoint two *Secretaries*, who are to reply to all Addreſſes from abroad, and at home; and to publiſh whatever ſhall be agreed upon by the *Society*. Theſe are at preſent, Dr. *Wilkins*, and Mr. *Oldenbourgh*, from whom I have not uſurp'd this firſt imployment of that kind; for it is onely my hand that goes, the ſubſtance and direction came from one of them.

This is all that I have to ſay concerning their *Ceremonial part*. In moſt other things, they bounded themſelves to no ſtanding Orders, there being nothing more intended in ſuch *circumſtances*, than convenience and order. If any ſhall imagine, they have not limited themſelves to *Forms* enough, to keep up the gravity, and ſolemnity of ſuch an Enterpriſe, they are to conſider, that ſo much exactneſs and curioſity of obſervances, does not ſo well befit *Inquirers*, as *Sects* of Philoſophy, or places appointed for Education, or thoſe who ſubmit themſelves to the ſeverity of ſome religious Order. The Work which the *Society* propoſes to it ſelf, being not ſo fine, and eaſie, as that of teaching is; but rather a painful digging, and toiling in *Nature*; It would be a great incumbrance to them, to be ſtraightned to many ſtrict *punctilioes*; as much as it would be to an *Artificer*, to be loaded with many cloaths, while he is labouring in his Shop.

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But having made ſo much haſt through *the Formal part of theſe their Meetings*, I ſhall not ſo ſoon diſpatch *the ſubſtantial*; which conſiſts in *Directing*, *Judging*, *Conjecturing*, *Improving*, *Diſcourſing* upon *Experiments*.

Towards the firſt of theſe ends, it has been their uſual courſe, when they themſelves appointed the *Trial*, to propoſe one week, ſome particular *Experiments*, to be proſecuted the next; and to debate before hand, concerning all things that might conduce to the better carrying them on. In this *Præliminary Collection*, it has been the cuſtom, for any of the *Society*, to urge what came into their thoughts, or memories concerning them; either from the obſervations of others, or from *Books*, or from their own *Experience*, or even from common *Fame* it ſelf. And in performing this, they did not exerciſe any great rigour of chooſing, and diſtinguiſhing between *Truths* and *Falſhoods*: but a maſs altogether as they came; the certain Works, the Opinions, the Gheſſes, the Inventions, with their different Degrees and Accidents, the Probabilities, the Problems, the general Conceptions, the miraculous Stories, the ordinary Productions, the changes incident to the ſame Matter in ſeveral places, the Hindrances, the Benefits, of *Airs*, or *Seaſons*, or *Inſtruments*; and whatever they found to have been begun, to have fail'd, to have ſucceeded, in the Matter which was then under their Diſquiſition. Sect. XVI. *Their directing Experiments.*

This is a moſt neceſſary preparation, to any that reſolve to make a perfect ſearch. For they cannot but go blindly, and lamely, and confuſedly about the buſineſs, unleſs they have firſt laid before them a full *Account* of it. I confeſs the excellent *Monſieur des Cartes*

Cartes recommends to us another way in his *Philoſophical Method*; where he gives this Relation of his own progreſs; that after he had run through the uſual Studies of youth, and ſpent his firſt years in an active life; when he retir'd to ſearch into *Truth*, he at once rejected all the *Impreſſions*, which he had before receiv'd, from what he had heard, and read; and wholly gave himſelf over to a reflexion on the naked *Ideas* of his own mind. This he profeſs'd to do, that he might lay aſide all his *old imaginations*, and begin anew to write on a white and unblotted *Soul*. This, perhaps, is more allowable in matters of *Contemplation*, and in a *Gentleman*, whoſe chief aim was his own delight; and ſo it was in his own choice, whether or no, he would go farther to ſeek it, than his own mind: But it can by no means ſtand with a practical and univerſal *Inquiry*. It is impoſſible, but they, who will onely tranſcribe their own thoughts, and diſdain to meaſure or ſtrengthen them by the aſſiſtance of others, ſhould be in moſt of their apprehenſions too narrow, and obſcure; by ſetting down things for general, which are onely peculiar to themſelves. It cannot be avoided, but they will commit many groſs miſtakes; and beſtow much uſeleſs pains, by making themſelves wilfully *ignorant* of what is already known, and what conceal'd. It was try'd amongſt the *Antients*, to find out the pure, and Primitive Language of the World, by breeding up a child ſo, that he might never hear any man ſpeak. But what was the event of that trial? Inſtead of obtaining that end, the child was made abſolutely dumb thereby. And the like ſucceſs will that *Philoſopher* find, who ſhall expect, that, by the keeping his mind free from the *Tincture* of all others *Opinions*, it will give him the original, and uninfected

infected *Truths* of things. All *Knowledg* is to be got the ſame way that a Language is, by *Induſtry*, *Uſe*, and *Obſervation*. It muſt be receiv'd, before it can be drawn forth. 'Tis true, the mind of Man is a Glaſs, which is able to repreſent to it ſelf, all the Works of *Nature*: But it can onely ſhew thoſe Figures, which have been brought before it: It is no *Magical Glaſs*, like that with which *Aſtrologers* uſe to deceive the Ignorant; by making them believe, that therein they may behold the Image of any *Place*, or *Perſon* in the World, though never ſo farr remov'd from it. I know it may be here ſuggeſted; that they, who buſie themſelves much abroad, about learning the judgments of others, cannot be unprejudic'd in what they think. But it is not the *knowing*, but the peremptory *addiction* to others *Tenents*, that ſowers and perverts the *Underſtanding*. Nay, to go farther; that man, who is throughly acquainted with all ſorts of *Opinions*, is very much more unlikely, to adhere obſtinately to any one particular, than he whoſe head is onely fill'd with thoughts, that are all of one colour.

It being now ſo requiſite, to premiſe this general collection: It could not be better made, than by the *joint labours* of the whole *Society*. It were an intolerable burthen, if it were wholly caſt on the *Experimenters* themſelves. For, it is not onely true, that thoſe who have the beſt faculty of *Experimenting*, are commonly moſt averſe from reading Books; and ſo it is fit, that this *Defect* ſhould be ſupply'd by others pains: But alſo it would too much tire, and waſt, or at leaſt divert their ſpirits, before they came to the main Work. Whereas the *Task* being ſhar'd amongſt ſo great a number, will become not much more than a buſineſs of *delight*. Well then, by

this firſt *Comment*, and *Diſcourſe* upon the *Experiment*; he, that is to try it, being preſent; and having ſo good an opportunity, of comparing ſo many other mens conceptions with his own, and with the *thing* it ſelf; muſt needs have his thoughts more enlarg'd, his judgment confirm'd, his eyes open'd to diſcern, what moſt compendious helps may be provided; what part of it is more or leſs uſeful; and upon what ſide it may be beſt attempted: The *Truths* which he learns this way, will be his Pattern; the *Errors* will be his Sea-marks, to teach to avoid the ſame dangers; the very falſhoods themſelves will ſerve to enlarge, though they do not inform his *Underſtanding*. And, indeed, a thouſand more advantages will hereby come into the minds of the moſt Sagacious, and acute *Inquirers*, which they would never have compaſs'd, if they had been onely left to themſelves. I remember my Lord *Bacon* ſome where ſays; *That it is one of the greateſt ſecrets of Nature, that mens Paſſions are more capable, of being rais'd to higher degrees in company, than in ſolitude: and that we ſooner grieve, fear, rejoyce, love, admire, when we behold many others ſo mov'd, than when we are alone.* This is true; and the ſame may be as well affirm'd, of moſt other actions of the mind. In *Aſſemblies*, the *Wits* of moſt men are *ſharper*, their *Apprehenſions readier*, their *Thoughts fuller*, than in their *Cloſets*. Of this there is an undoubted proof in the *Art of ſpeaking*. For, let the wittieſt, and moſt eloquent men think as largely as they can, on any ſubject in private; yet, when they come into the publick; and eſpecially, when they have heard others ſpeak before them, their *Argument* appears quite another thing to them; their former expreſſions ſeem too flat, and cold for their preſent thoughts; their minds ſwell,

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and are enlightned, as if at that time they were poſſeſs'd with the *Souls* of the whole multitude, before whom they ſtand.

Sect. XVII. *Their judging of the matter of Fact.*

Thoſe, to whom the conduct of the *Experiment* is committed, being diſmiſs'd with theſe advantages, do (as it were) carry the eyes, and the imaginations of the whole company into the *Laboratory* with them. And after they have perform'd the *Trial*, they bring all the *Hiſtory* of its *proceſs* back again to the *teſt*. Then comes in the ſecond great Work of the *Aſſembly*; which is to *judg*, and *reſolve* upon the matter of *Fact*. In this part of their imployment, they us'd to take an exact view of the repetition of the whole courſe of the *Experiment*; here they obſerv'd all the *chances*, and the *Regularities* of the proceeding; what *Nature* does willingly, what conſtrain'd; what with its own power, what by the ſuccours of Art; what in a conſtant rode, and what with ſome kind of ſport and extravagance; induſtriouſly marking all the various ſhapes into which it turns it ſelf, when it is perſued, and by how many ſecret paſſages it at laſt obtains its end; never giving it over till the whole *Company* has been fully ſatisfi'd of the certainty and conſtancy; or, on the otherſide, of the abſolute impoſſibility of the effect. This *critical*, and *reiterated ſcrutiny* of thoſe things, which are the plain objects of their eyes; muſt needs put out of all reaſonable diſpute, the reality of thoſe operations, which the *Society* ſhall poſitively determine to have ſucceeded. If any ſhall ſtill think it a juſt *Philoſophical liberty*, to be jealous of reſting on their credit: they are in the right; and their *diſſentings* will be moſt thankfully receiv'd, if they be eſtabliſh'd on ſolid works, and not onely on *prejudices*, or

ſuſpicions. To the *Royal Society* it will be at any time almoſt as acceptable, to be *confuted*, as to *diſcover*: ſeeing, by this means, they will accompliſh their main *Deſign*: others will be inflam'd: many more will labour; and ſo the *Truth* will be obtain'd between them: which may be as much promoted by the *contentions* of hands, and eyes; as it is commonly injur'd by thoſe of Tongues. However, that men may not hence undervalue their *authority*, becauſe they themſelves are not willing to impoſe, and to uſurp a *dominion* over their *reaſon*; I will tell them, that there is not any one thing, which is now approv'd and practis'd in the World, that is confirm'd by ſtronger evidence, than this, which the *Society* requires; except onely the *Holy Myſteries of our Religion.* In almoſt all other matters of *Belief*, of *Opinion*, or of *Science*; the aſſurance, whereby men are guided, is nothing near ſo firm, as this. And I dare appeal to all *ſober men*; whether, ſeeing in all Countreys, that are govern'd by Laws, they expect no more, than the conſent of two, or three witneſſes, in matters of life, and eſtate; they will not think, they are fairly dealt withall, in what concerns their *Knowledg*, if they have the concurring Teſtimonies of *threeſcore or an hundred?*

Sect. XVIII. *Their conjecturing on the Cauſes.*

The *Hiſtory*, of the *Trial* perform'd, being thus ſecur'd, I will next declare, what room they allow'd for conjecturing upon the *Cauſes*; about which they alſo took ſome pains, though in a farr different way from the antient *Philoſophers*; amongſt whom, ſcarce any thing elſe was regarded, but ſuch *general contemplations.* This indeed, is the *Fatal point*, about which ſo many of the greateſt *Wits* of all Ages have miſcarried;

ried; and commonly, the greater the Wit, the more has been the danger: ſo many wary ſteps ought to be troden in this uncertain path: ſuch a multitude of pleaſing *Errors*, falſe *Lights*, diſguiſed *Lies*, deceitful *Fancies* muſt be eſcap'd: ſo much care muſt be taken, to get into the right way at firſt: ſo much, to continue in it; and at laſt, the greateſt caution ſtill remaining to be us'd; leſt when the treaſure is in our view, we undo all, by catching at it too ſoon, with too greedy, and raſh a hand. Theſe, and many more are the difficulties, to be paſs'd; which I have here with leſs apprehenſion reckon'd up, becauſe the remedy is ſo nigh. To this *Work* therefore the *Society* approaches, with as much circumſpection and modeſty, as humane counſels are capable of: They have been cautious, to ſhun the overweening *dogmatizing* on cauſes on the one hand: and not to fall into a *ſpeculative Scepticiſm* on the other: and whatever cauſes they have with juſt deliberation found to hold good; they ſtill make them increaſe their benefits, by farther experimenting upon them; and will not permit them to ruſt or corrupt, for want of uſe. If after all this, they ſhall not ſeem wholly to have remov'd the *miſchiefs*, that attend this *hazardous matter*; they ought rather to be judg'd, by what they have done towards it above others, than by what they have not provided againſt: ſeeing the thing it ſelf is of that nature; that it is impoſſible to place the minds of men beyond all condition of erring about it.

The firſt *Danger* that I ſhall obſerve in this kind, is an *over-haſty*, and *præcipitant* concluding upon the *Cauſes*, before the *Effects* have been enough ſearch'd into: a finiſhing the *roof*, before the *foundation* has been well laid. For this, I ſhall firſt allege this cure; that,

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that, though the *Experiment* was but the private task of one or two, or ſome ſuch ſmall number; yet the *conjecturing*, and *debating* on its *conſequences*, was ſtill the employment of their full, and ſolemn *Aſſemblies*. I have already, upon ſeveral occaſions, preferr'd *Companies* before *ſingle endeavours* in *Philoſophical* matters; and yet I am not aſham'd here to repeat it again; eſpecially, ſeeing in this place, it is moſt apparent, to which of them the prerogative of freedom, and clearneſs of judging belongs. To this purpoſe I ſhall affirm, that there can never be found, in the breaſt of any particular *Philoſopher*, as much warineſs, and coldneſs of thinking, and rigorous examination; as is needfull, to a ſolid *aſſent*, and to a laſting *concluſion*, on the whole frame of *Nature*. How can it be imagin'd, that any ſingle mind can comprehend, and ſuſtain long enough the weight of ſo many different *Opinions*, and infinite *Obſervations*; when even the beſt *Mathematicians* are ſoon tyr'd, with a long train of the moſt delightful *Propoſitions*, which were before made to their hands? Or, if there could be a man of that vaſtneſs of *Soul*; yet, how can we be aſſur'd, that he will hold the *ſcale* even? where have we ever had an example of ſo much ſtreightneſs, and impartiality of judgment; to perſuade us, that the *calmeſt Philoſopher* will not be inſenſibly inclin'd, to preferr his own *Doctrines*, before thoſe of a ſtranger? We ſee all the world flatter themſelves in their *ſtrength*, *beauty*, nay, even (as ſome have noted) in their very *Statures*; the loweſt men ſcarce believing, but that they are tall enough. Why then ſhould they be ſingly truſted in their votes about their own thoughts; where the compariſon of Wit, makes them more eagerly concern'd? If we follow the *Philoſopher* home into

into his ſtudy; we ſhall quickly diſcover, by how many *plauſible degrees*, the wiſeſt men are apt to deceive themſelves, into a *ſudden confidence* of the certainty of their knowledg. We will ſuppoſe him, to begin his *Inquiry*, with all the ſincerity imaginable: reſolving to paſs by no ſmall miſtake, and to forgive to himſelf no ſlight error in the *accompt*; with theſe *fair purpoſes*, he pitches on ſome *particular ſubject*: This he turns, and tortures every way; till, after much labour, he can make ſome gheſſes at its *Cauſes*: upon this, his induſtry increaſes: he applies the ſame matter to ſeveral other operations: he ſtill finds the effects anſwer his expectations: Now he begins to mould ſome *general Propoſition* upon it: he meets with more and more proofs to confirm his *judgment*: thus he grows by little and little, warmer in his *imaginations*: the delight of his ſucceſs ſwells him: he triumphs and applauds himſelf, for having found out ſome *important Truth*: But now his Trial begins to ſlacken: now *impatience* and *ſecurity* creeps upon him: now he careleſly admits whole crouds of Teſtimonies, that ſeem any way to confirm that *Opinion*, which he had before eſtabliſh'd: now he ſtops his ſurvay, which ought to have gone forward to many more *particulars*; and ſo at laſt, this *ſincere*, this *invincible Obſerver*, out of wearineſs, or preſumption, becomes the moſt negligent in the later part of his work, in which he ought to have been the moſt exact. Such is the univerſal inclination of mankind, to be miſ-led by themſelves: which I have mention'd, not to beat down the credit of any particular *Philoſophers*, whoſe *ſuperſtructures* have not bin anſwerable to the ſtrength of their firſt *aſſertions*: but I have onely complain'd of it in general; as we uſe to do of Man's mortality, and being

ing ſubject to diſeaſes: the aggravating of which common infirmities, can never be eſteem'd by any private man, as an effect of *malice*, or *ill nature*.

But now, on the other ſide, this *doubtfulneſs* of thoughts, this *fluctuation*, this *ſlowneſs* of concluding, which is ſo uſefull in this caſe, is ſo natural to a multitude of Counſellors; that it is frequently urg'd againſt them, as their *inſeperable Imperfection*. Every man has this Argument in his mouth, wherewith to condemn a great and mixt number of adviſers; that their *deliberations* are ſo tedious, that commonly the *ſeaſons of Action* are loſt, before they can come to any reſult. 'Tis true, this unweildineſs, and want of diſpatch, is moſt deſtructive in *matters of State*, and *Government*; as Chriſtendom lately felt: But it has a quite contrary influence on *Philoſophy*. It is not here the moſt ſpeedy, or the ſwifteſt determination of thoughts, that will do the buſineſs: here, many delays are requir'd: here, he that can make a *ſolid objection*, or ask a *ſeaſonable queſtion*, will do more good, than he, who ſhall boldly fix on a hundred *ill-grounded reſolutions*. Every rubb is here to be ſmooth'd: every ſcruple to be plain'd: every thing to be foreſeen: the ſatisfaction of the reaſon of all paſt, preſent, and future times to be deſign'd: ſo that here, that-which is ſo much cry'd down in *policy*, a ſtriving ſtill to do better, can never be too much regarded.

Nor is the *Society* only fore-arm'd againſt this great *inconvenience*, this raſhneſs of ſetling upon cauſes, by the multitude of Judges that are to be ſatisfy'd: but alſo by their indifferent hearing of all *conjectures*, that may be made from the Tenents of any *Sect of Philoſophy*; and by touching every effect that comes before them; upon all the *varieties of opinions*,

pinions, that have been either of late found out, or reviv'd. By this equality of reſpect to all parties, it has allow'd a ſufficient time, to ripen whatever it debated: By this too, it has made it ſelf the common *Cheriſher*, and *Umpire* of them all: and has taken the right way of finding out, what is good in any one of them. A courſe, which if the Antients had more follow'd, their Sects would not ſo ſoon have deſtroy'd each other. It was a moſt perverſe cuſtom amongſt their Diſciples, not to make any *ſtrict choice*; to leave ſome, and embrace others of their Maſters Doctrines, but to ſwallow all at once. He that became a *Stoick*, an *Epicurean*, a *Peripatetick*, in *Logick*, or *Moral Philoſophy*, or *Phyſicks*; never ſtuck, preſently to aſſent to whatever his Founder had ſaid in all the other *Sciences*: though there was no kind of connexion between his Doctrines in the one, and the other. Thus was the whole image of *Philoſophy* form'd in their minds altogether: And what they receiv'd ſo careleſly, they defended the ſame way; not in parcels, but in groſs. Of this the Errors are apparent; for by ſo *partially* believing all ſorts of Tenents, they had no time to be fully convinc'd: and ſo became rather *formal* Aſſerters of them, than *judicious*. And by thus adhering to all; without making any diſtinction between the Truths, and falſhoods; weakneſſes, and ſtrengths of *their Sects*; they deny'd to themſelves a farr more *calm*, and *ſafe knowledg*; which might have been compounded out of them all, by fetching ſomething from one, and ſomething from another.

This *the Royal Society* did well foreſee: and therefore did not regard the credit of *Names*, but *Things*: rejecting or approving nothing, becauſe of the title, which it bears: preſerving to it ſelf the liberty of re-

fuſing, or liking, as it found: and ſo advancing its ſtock, by a *ſure* and a *double increaſe*; by adding *new Diſcoveries*, and retaining *antient Truths*. A largeneſs, and generoſity, which certainly is an excellent *Omen* of its eſtabliſhment. In this, me-thinks, it excels any *other Sect*; as the *Roman Common-wealth*, did that of *Venice*. The later began upon a ſmall ſtock, and has been careful to preſerve it ſelf unmingled, beſtowing the freedom of its City very ſparingly: And we ſee, it has been ſtill on the defenſive; making no great progreſs in the World: whereas the *Romans*, by a far more frank, and honourable counſel, admitted all, that deſir'd to be their confederates; gave the liberty of *Roman Citizens* to whole Towns, and Countreys; excluded none, but thoſe that would *obſtinately* ſtand out: and ſo deſervedly extended their Empire, as farr as the bounds of the *civil World* did reach.

The ſecond miſchief in this great matter of cauſes, is an *eternal inſtability*, and *averſion* from aſſigning of any. This ariſes, from a violent, and imprudent haſt to avoid the firſt. So eaſie is the paſſage from one extreme to another; and ſo *hard* it is, to ſtop in that little point, wherein the right does conſiſt. The truth is, they are both almoſt equally pernicious: nothing *ſound* is to be expected from thoſe, who wil fix blindly on whatever they can lay hold on: and nothing *great* from them, who will always wander; who will never leave diſputing, whether they dream, or wake; whether there is any motion; whether they have any being, or no: the *one* can produce nothing, but *unwholeſome*, and *rotten* fruits: and the *other*, for fear of that, will endeavour to have no *Harveſt*, nor *Autumn* at all.

To this fault of *Sceptical doubting*, the *Royal-Society*

ciety may perhaps be ſuſpected, to be a little too much inclin'd: becauſe they always profeſſed, to be ſo backward from *ſetling* of *Principles*, or *fixing* upon *Doctrines*. But if we fairly conſider their intentions, we ſhall ſoon acquit them. Though they are not yet very daring, in eſtabliſhing concluſions; yet they lay no injunctions upon their ſucceſſors not to do the ſame, when they ſhall have got a ſufficient ſtore for ſuch a work. It is their ſtudy, that the way to attain a *ſolid ſpeculation*, ſhould every day be more and more perſued: which is to be done, by a long forbearing of *ſpeculation* at firſt, till the matters be ripe for it; and not, by madly ruſhing upon it in the very beginning. Though they do not contemplate much on the *general* agreements of things; yet they do on the *particular*: from whence the others alſo will in time be deduc'd. They are therefore as farr from being *Scepticks*, as the greateſt *Dogmatiſts* themſelves. The *Scepticks* deny all, both *Doctrines*, and *Works*. The *Dogmatiſts* determine on *Doctrines*, without a ſufficient reſpect to *Works*: and this Aſſembly, (though we ſhould grant, that they have wholly omitted *Doctrines*) yet they have been very poſitive and affirmative in their *Works*. But more than this, It muſt alſo be confeſs'd, that ſometimes after a full inſpection, they have ventur'd to give the advantage of probability to one Opinion, or Cauſe, above another: Nor have they run any manner of hazard by thus concluding. For firſt, it is likely, they did hit the *right*, after ſo long, ſo punctual, and ſo gradual an examination: or if we ſuppoſe the worſt, that they ſhould ſometimes judg *amiſs* (as we cannot but allow they may; ſeeing it will not be juſt to beſtow infallibility on them alone; while we deny it to all others)

yet they have taken care, that their *weaker reaſonings*, and even their *Errors*, cannot be very prejudicial to Poſterity. The cauſes, upon which they have agreed, they did not preſently extend, beyond their due ſtrength, to all other things, that ſeem to bear ſome reſemblance to what they try'd. Whatever they have reſolv'd upon; they have not reported, as *unalterable Demonſtrations*, but as *preſent appearances*: delivering down to future Ages, with the good ſucceſs of the Experiment, the *manner* of their progreſs, the *Inſtruments*, and the ſeveral differences of the *matter*, which they have apply'd: ſo that, with their miſtake, they give them alſo the means of finding it out. To this I ſhall add, that they have never affirm'd any thing, concerning the cauſe, till the trial was paſt: whereas, to do it before, is a moſt venomous thing in the making of *Sciences*: for whoever has fix'd on his *Cauſe*, before he has experimented; can hardly avoid fitting his *Experiment*, and his Obſervations, to his own *Cauſe*, which he had before imagin'd; rather than the *Cauſe* to the truth of the *Experiment* it ſelf. But, in a word, they have hitherto made little other benefit of the *cauſes*, to which they have conſented; than that thereby they might have a firm footing, whereon *new operations* may proceed. And for this Work, I mean a continuation, and variation of the *Inquiry*; the tracing of a *falſe* Cauſe; doth very often ſo much conduce; that, in the progreſs, the *right* has been diſcover'd by it. It is not to be queſtion'd, but many inventions of great moment, have been brought forth by Authors, who began upon ſuppoſitions, which afterwards they found to be untrue. And it frequently happens to *Philoſophers*, as it did to *Columbus*: who firſt believ'd the *clouds*, that hover'd about the Continent, to be

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the firm *Land:* But his miſtake was happy; for, by ſailing towards them, he was led to what he ſought: ſo by proſecuting of *miſtaken Cauſes*, with a reſolution of not giving over the perſute; they have been guided to the *truth* it ſelf.

The laſt Defect is, the rendring of Cauſes barren: that when they have been found out, they have been ſuffer'd to lye idle; and have been onely us'd, to increaſe thoughts, and not works. This negligence is of all others the moſt dangerous: It is a *Shipwrack* in the end of the *voiage*, and thence the more to be pitied: It is a corruption, that both hinders additions, and eats out the knowledg that has been already obtain'd: It is the fault of *Philoſophers*, and not of meer *Inquirers*; of thoſe that have been *ſucceſsfull*, and not of the *unfortunate* in their ſearch: and therefore it is, as the miſcarriages of thoſe, that are proſperous in humane actions; which are always obſerv'd to be more deſtructive, and harder to be cur'd, than the failings of the afflicted, or thoſe that are ſtill in perſute.

Sect XIX. *Their way of Improving.*

To this the *Royal Society* has apply'd a double prevention; both by endeavouring to ſtrike out *new Arts*, as they go along; and alſo, by ſtill improving all to *new experiments.*

Of the poſſibility of their performing the firſt; and the Method, which is to be taken about it; I ſhall ſhortly ſpeak in another place. It is enough here, to ſay; that by this, they have taken care, to ſatisfie the *hopes* of the *preſent times*; which elſe might juſtly languiſh, and grow cold about this enterpriſe: if they once ſaw, that nothing would be ripe in their days; but that all was to come up *hereafter*, for the advantage of thoſe, that are yet unborn. They conſulted the

the good of *Future* times; but have not neglected their own; they have practis'd both the parts of *good Husbandry*; planting Trees, and ſowing Corn. This later, for their own ſpeedy benefit, and ſupport; and the other, for the profit, and ornament of after-Ages.

Nor have they ſuffer'd their diligence to be ſwallow'd up, by the pleaſures, and enjoyments of *preſent* diſcoveries; but have ſtill ſubmitted their nobleſt Inventions, to be made Inſtruments, and means, for the finding out of *others*. This certainly is the moſt comprehenſive, and unerring Method; at once to make uſe of that aſſiſtance, they give, and to force them, to be farther helpfull to greater ends. There is nothing of all the works of Nature, ſo inconſiderable, ſo remote, or ſo fully known; but, by being made to reflect on other things, it will at once enligten them, and ſhew it ſelf the clearer. Such is the dependance amongſt all the orders of creatures; the inanimate, the ſenſitive, the rational, the natural, the artificial: that the apprehenſion of one of them, is a good ſtep towards the underſtanding of the reſt: And this is the higheſt pitch of *humane reaſon*; to follow all the links of this chain, till all their ſecrets are open to our minds; and their works advanc'd, or imitated by our hands. This is truly to command the world; to rank all the *varieties*, and *degrees* of things, ſo orderly one upon another; that ſtanding on the top of them, we may perfectly behold all that are below, and make them all ſerviceable to the quiet, and peace, and plenty of Man's life. And to this happineſs, there can be nothing elſe added: but that we make a ſecond advantage of this *riſing ground*, thereby to look the nearer into heaven: An ambition, which

which though it was puniſh'd in the *old World*, by an *univerſal Confuſion*; when it was manag'd with *impiety*, and *inſolence*: yet, when it is carried on by that *humility* and *innocence*, which can never be ſeparated from true knowledg; when it is deſign'd, not to *brave* the Creator of all things, but to *admire* him the more: it muſt needs be the utmoſt perfection of *humane Nature.*

Sect. XX. *Their manner of Diſcourſe.*

Thus they have directed, judg'd, conjectur'd upon, and improved *Experiments.* But laſtly, in theſe, and all other buſineſſes, that have come under their care; there is one thing more, about which the *Society* has been moſt ſollicitous; and that is, the manner of their *Diſcourſe*: which, unleſs they had been very watchful to keep in due temper, the whole ſpirit and vigour of their *Deſign*, had been ſoon eaten out, by the luxury and redundance of *ſpeech.* The ill effects of this ſuperfluity of talking, have already overwhelm'd moſt other *Arts* and *Profeſſions*; inſomuch, that when I conſider the means of *happy living*, and the cauſes of their corruption, I can hardly forbear recanting what I ſaid before; and concluding, that *eloquence* ought to be baniſh'd out of all *civil Societies*, as a thing fatal to Peace and good Manners. To this opinion I ſhould wholly incline; if I did not find, that it is a Weapon, which may be as eaſily procur'd by *bad* men, as *good*: and that, if theſe ſhould onely caſt it away, and thoſe retain it; the *naked Innocence* of vertue, would be upon all occaſions expos'd to the *armed Malice* of the wicked. This is the chief reaſon, that ſhould now keep up the Ornaments of ſpeaking, in any requeſt: ſince they are ſo much degenerated from their original uſefulneſs. They were at firſt, no doubt,

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an admirable Inſtrument in the hands of *Wiſe Men:* when they were onely employ'd to deſcribe *Goodneſs, Honeſty, Obedience*; in larger, fairer, and more moving Images: to repreſent *Truth*, cloth'd with Bodies; and to bring *Knowledg* back again to our very ſenſes, from whence it was at firſt deriv'd to our underſtandings. But now they are generally chang'd to worſe uſes: They make the *Fancy* diſguſt the beſt things, if they come ſound, and unadorn'd: they are in open defiance againſt *Reaſon*; profeſſing, not to hold much correſpondence with that; but with its Slaves, *the Paſſions:* they give the mind a motion too changeable, and bewitching, to conſiſt with *right practice.* Who can behold, without indignation, how many miſts and uncertainties, theſe ſpecious *Tropes* and *Figures* have brought on our Knowledg? How many rewards, which are due to more profitable, and difficult *Arts*, have been ſtill ſnatch'd away by the eaſie vanity of *fine ſpeaking?* For now I am warm'd with this juſt Anger, I cannot with-hold my ſelf, from betraying the ſhallowneſs of all theſe ſeeming Myſteries; upon which, *we Writers*, and *Speakers*, look ſo bigg. And, in few words, I dare ſay; that of all the Studies of men, nothing may be ſooner obtain'd, than this vicious abundance of *Phraſe*, this trick of *Metaphors*, this volubility of *Tongue*, which makes ſo great a noiſe in the World. But I ſpend words in vain; for the evil is now ſo inveterate, that it is hard to know whom to *blame*, or where to begin to *reform.* We all value one another ſo much, upon this beautiful deceipt; and labour ſo long after it, in the years of our education: that we cannot but ever after think kinder of it, than it deſerves. And indeed, in moſt other parts of Learning, I look on it to be a thing almoſt

moſt utterly deſperate in its cure: and I think, it may be plac'd amongſt thoſe *general miſchiefs*; ſuch, as the *diſſention* of Chriſtian Princes, the *want of practice* in Religion, and the like; which have been ſo long ſpoken againſt, that men are become inſenſible about them; every one ſhifting off the fault from himſelf to others; and ſo they are only made bare common places of compiaint. It will ſuffice my preſent purpoſe, to point out, what has been done by the *Royal Society*, towards the correcting of its exceſſes in *Natural Philoſophy*; to which it is, of all others, a moſt profeſt enemy.

They have therefore been moſt rigorous in putting in execution, the only Remedy, that can be found for this *extravagance*: and that has been, a conſtant Reſolution, to reject all the amplifications, digreſſions, and ſwellings of ſtyle: to return back to the primitive purity, and ſhortneſs, when men deliver'd ſo many *things*, almoſt in an equal number of *words*. They have exacted from all their members, a cloſe, naked, natural way of ſpeaking; poſitive expreſſions; clear ſenſes; a native eaſineſs: bringing all things as near the Mathematical plainneſs, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars.

And here, there is one thing, not to be paſs'd by; which will render this eſtabliſh'd cuſtom of the *Society*, well nigh everlaſting: and that is, the general conſtitution of the minds of the *Engliſh*. I have already often inſiſted on ſome of the prerogatives of *England*; whereby it may juſtly lay claim, to be the Head of a *Philoſophical league*, above all other Countries in *Europe*: I have urg'd its ſcituation, its preſent Genius, and the diſpoſition of its Merchants; and

many more ſuch *arguments* to incourage us, ſtill remain to be us'd: But of all others, this, which I am now alledging, is of the moſt weighty, and important conſideration. If there can be a true character given of the *Univerſal Temper* of any Nation under Heaven: then certainly this muſt be aſcrib'd to our Countrymen: that they have commonly an unaffected ſincerity; that they love to deliver their minds with a ſound ſimplicity; that they have the middle qualities, between the reſerv'd ſubtle ſouthern, and the rough unhewn Northern people: that they are not extreamly prone to ſpeak: that they are more concern'd, what others will think of the ſtrength, than of the fineneſs of what they ſay: and that an univerſal modeſty poſſeſſes them. Theſe Qualities are ſo conſpicuous, and proper to our Soil; that we often hear them objected to us, by ſome of our neighbour Satyriſts, in more diſgraceful expreſſions. For they are wont to revile the *Engliſh*, with a want of familiarity; with a melancholy dumpiſhneſs; with ſlowneſs, ſilence, and with the unrefin'd ſullenneſs of their behaviour. But theſe are only the reproaches of partiality, or ignorance: for they ought rather to be commended for an honourable integrity; for a neglect of circumſtances, and flouriſhes; for regarding things of *greater* moment, more than *leſs*; for a ſcorn to deceive as well as to be deceiv'd: which are all the beſt indowments, that can enter into a *Philoſophical Mind*. So that even the poſition of our climate, the air, the influence of the heaven, the compoſition of the Engliſh blood; as well as the embraces of the Ocean, ſeem to joyn with the labours of the *Royal Society*, to render our Country, a Land of *Experimental knowledge*. And it is a good ſign, that Nature

ture will reveal more of its ſecrets to the Engliſh, than to others; becauſe it has already furniſh'd them with a Genius ſo well proportion'd, for the receiving, and retaining its myſteries.

Sect. II. *Their way of Regiſtring.*

And now, to come to a cloſe of the ſecond part of the *Narration*: The *Society* has reduc'd its principal obſervations, into one *common-ſtock*; and laid them up in publique *Regiſters*, to be nakedly tranſmitted to the next Generation of Men; and ſo from them, to their Succeſſors. And as their purpoſe was, to heap up, a mixt Maſs of *Experiments*, without digeſting them into any perfect model: ſo to this end, they confin'd themſelves to no order of ſubjects; and whatever they have recorded, they have done it, not as compleat Schemes of opinions, but as bare unfiniſh'd Hiſtories.

In the order of their *Inquiſitions*, they have been ſo free; that they have ſometimes committed themſelves to be guided, according to the ſeaſons of the year: ſometimes, according to what any foreiner, or Engliſh Artificer, being preſent, has ſuggeſted: ſometimes, according to any extraordinary accident in the Nation, or any other caſualty, which has hapned in their way. By which roving, and unſettled courſe, there being ſeldome any reference of one matter to the next; they have prevented others, nay even their own hands, from corrupting, or contracting the work: they have made the raiſing of *Rules*, and *Propoſitions*, to be a far more difficult *task*, than it would have been, if their *Regiſters* had been more *Methodical*. Nor ought this neglect of conſequence, and order, to be only thought to proceed from their *careleſneſs*; but from a mature, and well grounded *præmeditation*.

For it is certain, that a too ſudden ſtriving to reduce the *Sciences*, in their beginnings, into Method, and Shape, and Beauty; has very much retarded their increaſe. And it happens to the Invention of Arts, as to children in their younger years: in whoſe Bodies, the ſame *applications*, that ſerve to make them ſtrait, ſlender, and comely; are often found very miſchievous, to their eaſe, their ſtrength, and their growth.

By their fair, and equal, and ſubmiſſive way of *Regiſtring* nothing, but *Hiſtories*, and *Relations*; they have left room for others, that ſhall ſucceed, to *change*, to *augment*, to *approve*, to *contradict* them, at their diſcretion. By this, they have given *poſterity* a far greater power of judging them; than ever they took over thoſe, that went before them. By this, they have made a firm *confederacy*, between their own *preſent labours*, and the Induſtry of *Future Ages*; which how beneficial it will prove hereafter, we cannot better gheſſe, than by recollecting, what wonders it would in all likelyhood have produc'd e're this; if it had been begun in the Times of the *Greeks*, or *Romans*, or *Scholemen*; nay even in the very laſt reſurrection of learning. What depth of *Nature*, could by this time have been hid from our view? What Faculty of the Soul would have been in the dark? What part of human infirmities, not provided againſt? if our Predeceſſors, a thouſand, nay even a hundred, years ago, had begun to add by little, and little to the ſtore: if they would have indeavour'd to be *Benefactors*, and not *Tyrants* over our Reaſons; if they would have communicated to us, more of their *Works*, and leſs of their *Wit*.

This complaint, which I here take up, will appear the

the juſter; if we conſider, that the firſt *learned Times* of the Antients, and all thoſe, that follow'd after them, down to this day, would have receiv'd no prejudice at all; if their *Philoſophers* had chiefly beſtow'd their pains, in making *Hiſtories of Nature*, and not in *forming of Sciences*: perhaps indeed the names of ſome particular men, who had the luck to compile thoſe *Syſtemes*, and *Epitomes* which they gave us, would have been leſs glorious, than they are. Though that too may be doubted: and (if we may conclude any thing ſurely, upon a matter ſo changeable, as *Fame* is) we have reaſon enough to believe, that theſe later Ages would have honour'd *Plato*, *Ariſtotle*, *Zeno*, and *Epicurus*, as much, if not more, than now they do; if they had only ſet things in a way of propagating Experiences down to us; and not impos'd their *imaginations* on us, as the only *Truths*. This may be well enough ſuppos'd; ſeeing it is common to all mankind, ſtill to eſteem dearer the memories of their *Friends*, than of thoſe that pretend to be their *Maſters*.

But this matter of *reputation*, was only the *private* concernment of five, or ſix. As for the Intereſt of thoſe Times in general, I will venture to make good; that in all effects of *true knowledge*, they might have been as happy, without thoſe *Bodies* of *Arts*, as they were with them; *Logick*, and the *Mathematicks* only excepted. To inſtance in their *Phyſicks*: they were utterly uſeleſs, in reſpect of the good of mankind: they themſelves did almoſt confeſs ſo much, by reſerving all their *Natural Philoſophy*, for the retirements of their Wiſemen. What help did it ever bring to the vulgar? What viſible benefit to any City, or Country in the World? Their *Mechanicks*, and *Artificers* (for whom the

the True *Natural Philoſophy* ſhould be principally intended) were ſo far from being aſſiſted by thoſe *abſtruſe Doctrines*; that perhaps ſcarce any one of thoſe Profeſſions, and Trades, has well underſtood *Ariſtotles Principles of Bodies*, from *his own* Time down to *ours*. Hence then we may conclude, that thoſe *firſt Times*, wherein theſe *Arts* were made, had been nothing dammag'd; if, inſtead of raiſing ſo many *Speculative Opinions*, they had only minded the laying of a *ſolid ground-work*, for a vaſt Pile of *Experiments*, to be continually augmenting through all Ages.

And I will alſo add; that, if ſuch a courſe had been at firſt ſet on foot, *Philoſophy* would by this means have been kept cloſer to *material things*; and ſo, in probability, would not have undergone ſo many *Eclipſes*, as it has done ever ſince. If we reckon from its firſt ſetting forth in the *Eaſt*; we ſhall find, that in ſo long a Tract of Time, there have not been above four, or five hundred years, at ſeveral intervals, wherein it has been in any requeſt in the World. And if we look back on all the alterations, and ſubverſions of *States*, that have hapned in Civil Nations, theſe three thouſand years: we may ſtill behold, that the *Sciences of mens brains*, have been alwayes ſubject to be far more injur'd by ſuch viciſſitudes, than the *Arts of their hands*. What cauſe can be aſſign'd for this? Why was Learning the firſt thing, that was conſtantly ſwept away, in all deſtructions of Empire, and forein inundations? Why could not that have weather'd out the ſtorm, as well as moſt ſorts of Manufactures: which, though they began as ſoon, or before the other, yet they have remain'd, through all ſuch changes, unalter'd; except for the better? The Reaſon of this is evident. It is, becauſe *Philoſophy* had been ſpun out,

out, to ſo fine a thread, that it could be known but only to thoſe, who would throw away all their whole Lives upon it. It was made too ſubtile, for the *common*, and *groſs* conceptions of men of buſineſs. It had before in a meaſure been baniſh'd, by the Philoſophers themſelves, out of the World; and ſhut up in the ſhades of their walks. And by this means, it was firſt look'd upon, as moſt *uſeleſs*; and ſo fit, ſooneſt to be *neglected*. Whereas if at firſt it had been made to converſe more with the ſenſes, and to aſſiſt familiarly in all occaſions of *human life*; it would, no doubt, have been thought needful to be preſerv'd, in the moſt *Active*, and *ignorant* Time. It would have eſcap'd the fury of the Barbarous people; as well as the Arts of *Ploughing*, *Gard'ning*, *Cookery*, *making Iron and Steel*, *Fiſhing*, *Sailing*, and many more ſuch neceſſary handicrafts have done.

But it is too late to lament this error of the Antients; ſeeing it is not now to be repair'd. It is enough, that we gather from hence; that by bringing *Philoſophy* down again to mens ſight, and practice, from whence it was flown away ſo high: the *Royal Society* has put it into a condition of ſtanding out, againſt the Invaſions of *Time*, or even *Barbariſme* it ſelf: that by eſtabliſhing it on a firmer foundation, than the *airy Notions* of men alone, upon all the *works of Nature*; by turning it into one of the *Arts* of *Life*, of which men may ſee there is daily need; they have provided, that it cannot hereafter be extinguiſh'd, at the loſs of a Library, at the overthrowing of a Language, or at the death of ſome few *Philoſophers:* but that men muſt loſe their *eyes*, and *hands*, and muſt leave off deſiring to make their *Lives* convenient, or pleaſant; before they can be willing to *deſtroy* it.

Thus

Sect. XXI. *The occaſion of the Hindrance of the publiſhing this Hiſtory.*

Thus far I was come in my intended *work*, when my *hand* was ſtop'd, and my *mind* diſturb'd from writing, by the two greateſt diaſters, that ever befel our *Nation*, the *fatal Infection*, which overſpread the City of *London* in Sixty five; and the *dreadful firing* of the City it ſelf, in the year inſuing. Theſe two calamities may well be ſufficient, to excuſe the *delay* of publiſhing this *Book*: when the one of them devour'd as many *Men*, and the other as many *Books*, as the cruelleſt incurſion of the *Goths*, and *Vandals*, had ever done.

The *Plague* was indeed an irreparable dammage to the whole Kingdom: but that which chiefly added to the miſery, was the *time*, wherein it happen'd. For what could be a more deplorable accident, than that ſo many *brave men* ſhould be cut off by the *Arrow, that flies in the dark*, when our Country was ingag'd in a *forein War*, and when their Lives might have been honourably ventur'd on a glorious Theater in its defence? And we had ſcarce recover'd this *firſt misfortune*, when we receiv'd a *ſecond*, and a deeper wound; which cannot be equall'd in all *Hiſtory*, if either we conſider the obſcurity of its *beginning*, the irreſiſtible violence of its progreſs, the horror of its *appearance*, or the wideneſs of the ruine, it made, in one of the moſt renown'd *Cities* of the World.

Yet when on the one ſide, I remember, what *deſolation* theſe ſcourges of mankind have left behind them; and on the other, when I reflect on the *magnanimity*, wherewith the Engliſh Nation did ſupport the miſchiefs: I find, that I have not more reaſon to *bewail* the one, than to *admire* the other.

Upon

Upon our return after the abating of the *Plague*, what elſe could we expect, but to ſee the *ſtreets* unfrequented, the *River* forſaken, the *fields* deform'd with the *Graves* of the *Dead*, and the *Terrors* of *Death* ſtill abiding on the faces of the living? But inſtead of ſuch diſmal ſights, there appear'd almoſt the ſame throngs in all publick places, the ſame noiſe of *buſineſs*, the ſame freedom of convers, and with the return of the *King*, the ſame cheerfulneſs returning on the minds of the *people* as before.

Nor was their *courage* leſs, in ſuſtaining the *ſecond calamity*, which deſtroy'd their *houſes*, and *eſtates*. This the greateſt loſers indur'd with ſuch undaunted firmneſs of mind, that their example may incline us to believe, that not only the beſt *Natural*, but the beſt *Moral* Philoſophy too, may be learn'd from the ſhops of *Mechanicks*. It was indeed an admirable thing to behold, with what *conſtancy*, the meaneſt Artificers ſaw all the *labours* of their *lives*, and the *ſupport* of their *families* devour'd in an inſtant. The affliction 'tis true, was widely ſpread over the whole Nation: every place was fill'd with ſigns of *pity*, and *commiſeration*: But thoſe who had ſuffer'd moſt, ſeem'd the leaſt affected with the loſs: no *unmanly bewailings* were heard in the few *ſtreets*, that were preſerv'd: they beheld the Aſhes of their *Houſes*, and *Gates*, and *Temples*, without the leaſt expreſſion of Puſillanimity. If *Philoſophers* had done this, it had well become their profeſſion of Wiſdom: if *Gentlemen*, the nobleneſs of their *breeding*, and *blood* would have requir'd it. But that ſuch greatneſs of heart ſhould be found amongſt the poor *Artizans*, and the obſcure *multitude*, is no doubt one of the moſt honourable events, that ever happen'd. Yet ſtill there is one *circumſtance* be-

hind, which may raiſe our *wonder* higher: and that is, that amidſt ſuch horrible *ruines*, they ſtill proſecuted the *War* with the ſame *vigour*, and *courage*, againſt three of the moſt powerful States of all *Europe*. What Records of Time, or Memory of paſt Ages, can ſhew us a greater teſtimony of an invincible and heroick *Genius*, than this, of which I now ſpeak? that the ſound of the *Heralds* proclaiming new *Wars*, ſhould be pleaſant to the people, when the ſad voice of the *Bell-man* was ſcarce yet gone out of their ears? that the increaſe of their Adverſaries *Confederates*, and of their own *calamities*, ſhould be ſo far from affrighting them, that they rather ſeem'd to receive from thence a *new vigour*, and *reſolution*? and that they ſhould ſtill be eager upon *Victories*, and *Triumphs*, when they were thought almoſt quite exhauſted, by ſo great deſtructions?

Sect. XXII. *The Third Part of the Narration.*

From this *obſervation* my mind begins to take comfort, and to preſage, that as this *terrible Diſeaſe*, and *Conflagration* were not able to darken the honour of our *Princes Armes*; ſo they will not hinder the many noble *Arts*, which the *Engliſh* have begun under his *Reign* on the ſtrength of theſe hopes, and incouragements, I will now return to my former thoughts, and to the finiſhing of my interrupted *deſign*. And I come with the more earneſtneſs to perfect it, becauſe it ſeems to me, that from the ſad effects of theſe diſaſters, there may a new, and a powerful *Argument* be rais'd, to move us to double our labours, about the *Secrets of Nature*.

A *New City* is to be built, on the moſt advantageous Seat of all *Europe*, for Trade, and command. This therefore is the fitteſt Seaſon for men to apply their thoughts,

thoughts, to the improving of the *materials* of building, and to the inventing of better *models*, for *Houſes*, *Roofs*, *Chimnies*, *Conduits*, *Wharfs*, and *Streets*: all which have been already under the conſideration of the *Royal Society*: and that too, before they had ſuch a ſad occaſion of bringing their *obſervations* into practice. The mortality of this *Peſtilence* exceeded all others of later Ages. But the remembrance of it ſhould rather enliven than damp our *Induſtry*. When mankind is overrun with ſuch horrible invaſions of *Death*, they ſhould from thence be univerſally alarm'd, to uſe more diligence about preventing them for the future.

It is true, that terrible *evil* has hitherto in all Countries, been generally too ſtrong, for the former remedies of *Art*. But why ſhould we think that it will continue ſo for ever? Why may we not believe, that in all the vaſt compaſs of Natural virtues of things yet conceal'd, there is ſtill reſerv'd an *Antidote*, that ſhall be equal to this *poyſon*? If in ſuch caſes we only accuſe the *Anger* of *Providence*, or the *Cruelty* of *Nature*: we lay the blame, where it is not juſtly to be laid. It ought rather to be attributed to the *negligence* of men themſelves, that ſuch *difficult Cures* are without the bounds of their *reaſons power*.

If all men had deſponded at firſt, and ſunk under the burden of their own *infirmities*, almoſt every little wound, or pain of the leaſt *member*, had been as deadly, as the *Plague* at this time. It was by much Inquiry, and uſe, that moſt of the mildeſt diſeaſes became *curable*. And every firſt ſucceſs of this kind, ſhould alwayes ſtrengthen our aſſurance of farther conqueſts, even over this greateſt *Terror* of mankind. Diſtruſt, and deſpair of our own indeavours, is as

great a hindrance in the progreſs of the *True Philoſophy*, as it is wont to be in the riſe of mens private fortunes. Whoever aims not at the *greateſt* things, will ſeldome proceed much farther, than the *leaſt*. Whoever will make a right, and a fortunate Courtſhip to *Nature*, he cannot enterprife, or attempt too much: for *She* (as it is ſaid of other *Miſtreſſes*) is alſo a Miſtreſs, that ſooneſt yields to the *forward*, and the *Bold*.

I have hitherto deſcrib'd the firſt *Elements*, on which the *Royal Society* aroſe, and ſupported its beginnings: I have trac'd its progreſs from the firſt private indeavours of ſome of its *members*, till it became united into a *Regular conſtitution*: and from thence I have related their firſt *conceptions*, and *practices*, towards the ſetling of an univerſal, conſtant, and impartial ſurvey of the whole *Creation*. There now remains to be added in this Third part of my *Narration*, an Account of the *Incouragements* they have receiv'd from abroad, and at home; and a Particular Enumeration of the *Principal Subjects*, about which they have been emploi'd ſince they obtain'd the *Royal Confirmation*.

Sect XXIII. *The Reputation, and correſpondence of the R. S. abroad.*

I will firſt begin with the *eſteem*, which all the Civil world abroad has conceiv'd of their *Enterprize*. And I mention this with the more willingneſs, becauſe I believe, that our *Nation* ought juſtly to be reprov'd, for their exceſs of Natural *baſhfulneſs*, and for their want of care, to have their moſt excellent things repreſented to Strangers with the beſt advantage. This ſilent, and reſerv'd humour has no doubt been very prejudicial to us, in the judgment, that our Neighbours have often made, not only concerning the condition

dition of our *Learning*, but alſo of our *Political affairs*. I will therefore treſpaſs a little on this *diſpoſition* of my *Countrymen*, and affirm, that as the *Engliſh* name does manifeſtly get ground, by the bravery of their *Arms*, the Glory of their *Naval ſtrength*, and the ſpreading of their *Commerce*: ſo there has been a remarkable addition to its renown, by the ſucceſs, which all our *Neighbours* expect from this *Aſſembly*.

It is evident, that this *ſearching Spirit*, and this affection to *ſenſible Knowledge*, does prevail in moſt Countries round about us. 'Tis true, the conveniences for ſuch labours, are not equal in all places. Some want the aſſiſtance of others *hands*; ſome the contribution of others *purſes*: ſome the benefit of excellent *Inſtruments*, ſome the *Patronage* of the Civil *Magiſtrates*: But yet according to their ſeveral *powers*, they are every where intent on ſuch *practical Studies*. And the moſt conſiderable effects of ſuch attempts throughout *Europe*, have been ſtill recommended to this *Society*, by their *Authors*, to be examin'd, approv'd, or corrected.

In France.

The Country, that lies next to *England* in its ſcituation is *France*: and that is alſo neereſt to it, in its zeal for the promotion of *Experiments*. In that Kingdom, the *Royal Society* has maintain'd a perpetual intercourſe, with the moſt eminent men of *Art* of all conditions: and has obtain'd from them, all the help which might juſtly be hop'd for, from the *vigour*, and *activity*, and *readineſs* of mind, which is natural to that people. From their *Phyſicians*, *Chirurgeons*, and *Anatomiſts*, it has receiv'd many faithful *Relations* of extraordinary *Cures*: from their moſt judicious *Travellers* the Fruits of their *Voyages*: from their moſt famous

mous *Mathematicians*, divers *Problems*, which have been solv'd many different wayes: from their *Chymists* the effects of their *Fires*: and from others of their best *Observers*, many rarities, and discourses, of their *Fruits*, *Silk*, *Wine*, *Bread*, *Plants*, *Salt* and such Natural productions of their Soil. And, to instance once for all, it has been affectionately invited to a mutual *correspondence* by the *French Academy* of *Paris*: In which invitation, there is one expression, that ought not to be pass'd over in silence: that they acknowledge the *English Nation*, to have many advantages, for the propagating of *Real Philosophy*, which are wanting to all others. This Confession is true. Yet these advantages, unless they had been improv'd by this *institution*, had been only as those, that we have for fishing, objections, and arguments of our sloth.

In Italy. In *Italy* the *Royal Society* has an excellent priviledge of receiving, and imparting *Experiments*, by the help of one of their own *Fellows*, who has the opportunity of being *Resident* there for them, as well as for the *King*. From thence they have been earnestly invited to a mutual intelligence, by many of their most *Noble* Wits, but chiefly by the *Prince Leopoldo*, Brother to the Great Duke of *Thuscany*; who is the Patron of all the *Inquisitive Philosophers* of *Florence*: from whom there is coming out under his Name an account of their proceedings call'd *Ducat Experiments*. This application to the *Royal Society* I have mention'd, because it comes from that Country, which is seldome wont to have any great regard, to the *Arts* of these *Nations*, that lye on this side of their mountains.

In Germany. In *Germany*, and its neighbouring Kingdomes, the *Royal*

Royal Society has met with great veneration; as appears by ſeveral Teſtimonies, in their late *Printed Books*, which have been ſubmitted to its Cenſure: by many *Curioſities* of *Mechanick Inſtruments*, that have been tranſmitted to it: and by the *Addreſſes* which have been ſent from their *Philoſophical Inquirers*. For which kinds of Enterpriſes the temper of the *German* Nation, is admirably fit, both in reſpect of their peculiar dexterity in all ſorts of manual *Arts*, and alſo in regard of the plain, and unaffected ſincerity of their *manners*; wherein they ſo much reſemble the *Engliſh*, that we ſeem to have deriv'd from them the compoſition of our *minds*, as well as to have deſcended from their *Race*.

In the *Low-Countries*, their Intereſt, and Reputation has been eſtabliſh'd, by the Friendſhip of ſome of their chief Learned men, and principally of *Hugenius*. This Gentleman has beſtow'd his pains, on many parts of the *ſpeculative*, and *practical Mathematicks*, with wonderful ſucceſſes. And particularly his applying the Motion of *Pendulums* to Clocks, and Watches, was an excellent *Invention*. For thereby there may be a means found out, of bringing the *meaſures* of *Time*, to an exact *Regulation*: of which the benefits are infinite. In the proſecution of ſuch *Diſcoveries*, he has often requir'd the aid of this *Society*; he has receiv'd the light of their *Trials*, and a confirmation of his own, and has freely admitted their *alterations*, or *amendments*. And this learned correſpondence with him, and many others, is ſtill continued, even at this preſent time, in the breach between our *Countries*: Their Great Founder, and Patron ſtill permitting them to maintain the Traffick of *Sciences*, when all other *In the Low-countries*,

other *Commerce* is intercepted. Whence we may ghess, what may be expected from the peaceful part of our *Kings Reign*, when his very Wars are manag'd, without injury to the *Arts* of *Civil Knowledge*.

Visits of Forreiners.

But not to wander any farther in *particulars*, it may perhaps in *general* be safely computed, that there has been as large a communication of Forein *Arts*, and *Inventions*, to the *Royal Society*, within this small compass of time, as ever before did pass over the *English* Channel since the very first transportation of *Arts* into our *Island*. And that this benefit will still increase by the length of time is indubitable, from the *Reception*, which has been given to the *Scholars*, *Nobility*, *Embassadours*, and Forein *Princes*, who of late years have travell'd hither, to behold a *Country*, which had been the Stage of so famous a War, and so miraculous a Peace. All these have still visited the *Royal Society*, as one of the first, and Noblest *Fruits* of our *restoration*. From hence they have return'd home, with a free engagement of their assistance: the *men of learning* assuring it of a contribution of their *Labours*, and the *Statesmen*, and *Princes* of their *Authority*, and indeavours, in satisfying all *Philosophical Quæries*, with which they have been plentifully furnish'd.

It would be a useless pomp to reckon up a *Catalogue* of their *Names*: especially seeing they are already recorded with gratitude, in a more lasting *Monument*, The *Register* of the *Society*. Only it will not, I think, be amiss, if I mention the visit of one *Prince*, because it may afford us a profitable observation. When the Duke of *Brunswyck and Lunenbourgh* was introduc'd into their weekly *Assembly*, and had subscrib'd his name to their *Statutes*: there was according

ding to the Cuſtom, one of the *Fellows* appointed, to interpret to him, what Experiments were produc'd, and examin'd at that meeting. But his *Highneſs* told them, that it was not neceſſary, they ſhould put themſelves to that trouble: for he well underſtood our Language, having been drawn to the ſtudy of it, out of a deſire of reading our *Philoſophical Books*. From whence there may this concluſion be made, that if ever our *Native Tongue* ſhall get any ground in *Europe*, it muſt be by augmenting its *Experimental Treaſure*. Nor is it impoſſible, but as the *Feminine* Arts of *Pleaſure*, and *Gallantry* have ſpread ſome of our Neighbouring Languages, to ſuch a vaſt extent: ſo the *Engliſh Tongue* may alſo in time be more enlarg'd, by being the Inſtrument of conveying to the World, the *Maſculine* Arts of *Knowledge*.

Sect XXIV. *The incouragements the R. S. has receiv'd at home.*

I now come to relate, what *incouragements* this deſign has receiv'd at home in its Native ſoyl. And I will aſſure my *Reader*, that the *Original* of the *Royal Society* has found a general *approbation* within our ſelves, and that the moſt prudent men of all Profeſſions, and Intereſts, have ſhewn by their reſpects to theſe hopeful beginnings, that there is a *Reverence* due to the firſt trials, and intentions, as well as to the laſt accompliſhment of generous attempts.

From our Citizens.

Of our chief, and moſt wealthy *Merchants*, and *Citizens*, very many have aſſiſted it with their preſence: and thereby have added the induſtrious, punctual, and active *Genius* of men of *Traffick*, to the quiet, ſedentary, and reſerv'd temper of men of *Learning*. They have contributed their *labours*: they have help'd their *correſpondence*: they have employ'd

their *Factors* abroad, to anſwer their *Inquiries*; they have laid out in all Countries for *obſervations*: they have beſtow'd many conſiderable gifts on their *Treaſury*, and Repoſitory. And chiefly there is one *Bounty* to be here inſerted, which for the ſingular benefit that may be expected from it, deſerves the *applauſe* and *imitation* of this, and future times. It is the *eſtabliſhment* made by Sir *John Cutler*, for the reading on *Mechanicks*, in the place where the *Royal Society* ſhall meet. This is the firſt *Lecture* that has been founded of this kind, amidſt all the vaſt *munificence* of ſo many *Benefactors to Learning*, in this later Age. And yet this was the moſt neceſſary of all others. For this has chiefly caus'd the ſlow progreſs of *manual Arts*; that the *Trades* themſelves have never ſerv'd *apprentiſhips*, as well as the *Tradeſmen*: that they have never had any *Maſters* ſet over them, to direct and guide their works, or to vary, and enlarge their operations.

From our Phyſicians.

Of our *Phyſicians*, many of the moſt judicious, have contributed their *purſes*, their *hands*, their *judgments*, their *writings*. This they have done, though they have alſo in *London*, a Colledge peculiar to their *Profeſſion*; which ever ſince its firſt foundation, for the ſpace of a hundred and fifty years, has given the world a ſucceſſion of the moſt eminent *Phyſicians* of *Europe*. In *that* they confine themſelves to the advancement of *Phyſick*: But in *this*, they have alſo with great zeal, and ability, promoted this *univerſal inſpection*, into all *Natural knowledge*. For without danger of *flattery*, I will declare of the *Engliſh Phyſicians*, that no part of the world exceeds them, not only in the skill of their own *Art*, but in *general Learning*: and of very many of that profeſſion I will affirm, that *All*

Apollo

Apollo is their own, as it was ſaid by the beſt *Poet* of this Age, of one of the moſt excellent of their number.

Of our *Nobility*, and *Gentry*, the moſt *Noble* and *Illuſtrious* have condeſcended, to labour here with their *hands*, to impart their *diſcoveries*, to propoſe their *doubts*, to aſſiſt, and defray the *charge* of their *Trials*. And this they have done with ſuch a univerſal agreement, that it is almoſt the only thing, wherein the *Nobility* of all the three Kingdoms are *united*. In their *Aſſemblies* for making Laws they are ſeparated: in their cuſtomes, and manners of life they differ: And in their humours too, they are thought not much of kin to each other. But in the *Royal Society* the *Scotch*, the *Iriſh*, the *Engliſh* Gentry do meet, and communicate, without any diſtinction of *Countries*, or affections. From hence no doubt very much *Political*; as well as *Philoſophical* benefit will ariſe. By this means, there is a good foundation laid, for the removing of that averſion, which the *Engliſh* are ſometimes obſerv'd to expreſs to the *Natives* of thoſe Kingdoms: which though perhaps it ariſes from the Knowledge of their own *advantages* above the other, yet it is a great hindrance to the growth of the *Britiſh power*. For as a Kingdom divided againſt it ſelf, cannot ſtand; ſo three Kingdomes divided from each other, in *Tempers*, *Studies*, and *Inclinations*, can never be great, upon one common intereſt. *From our Nobility.*

Of our *Miniſters of State at home*, and our *Embaſſadours abroad*, there have been very few employ'd, who are not *Fellows* of the *Royal Society*: and eſpecially theſe later, have beſtow'd their pains in *forein Courts*, to collect *Relations*, and Secrets of Nature, as well as *From our Stateſmen.*

of State: For which ſervice their way of life is moſt convenient, by the generality of their converſe, the *priviledges*, and *freedom* of their *diſpatches*; and the uſual Reſort of the moſt knowing, and inquiſitive men to their company.

From our Souldiers. Our Greateſt *Captains*, and *Commanders* have inroll'd their *Names* in this number, and have regarded theſe *Studies*: which are not, as other parts of *Learning*, to be call'd the *Studies of the Gown*, for they do as well become the profeſſion of a *Souldier*, or any other way of life. Nor have our moſt renowned *Generals* neglected the opportunities of *Philoſophical* Inquiries, even in the midſt of their greateſt *Enterprizes*, on which the fate of *Kingdoms* has depended. They have been furniſh'd with Inſtruments, and directions by the *Royal Society*, and amidſt the Tumult of *Wars*, and *Government* of *Fleets*, they have found leiſure to make ſome *Trials* of *Experiments*: which works as much excell that of *Declaiming*, which ſome of the *Roman Generals* us'd in their *Camps*, as it is better to *do*, than to *talk* well.

From our Churchmen. Of our *Churchmen* the Greateſt and the moſt *Reverend*, by their care, and paſſion, and indeavours, in advancing this *Inſtitution*, have taken off the unjuſt ſcandal from *Natural* knowledge, that it is an Enemy to *Divinity*. By the perpetual *Patronage*, and *aſſiſtance*, they have afforded the *Royal Society*, they have confuted the falſe opinions of thoſe men, who believe that *Philoſophers* muſt needs be *irreligious*: they have ſhewn that in our *veneration* of *Gods almighty power*, we ought to imitate the manner of our reſpect to *Earthly Kings*. For as, the greater their *Dominion* is, the

the more obſervance is wont to be given to their neereſt Servants and Officers: ſo the greatneſs of the *Divine Majeſty* is beſt to be worſhipp'd, by the due honouring, and obſerving of *Nature*, which is his immediate Servant, and the univerſal *Miniſter* of his *pleaſure*.

Sect. XXV. *From the Royal Family.*

But I make haſt to that, which ought to be eſteem'd the very *life*, and ſoul of this *undertaking*, the protection, and favour of the *King*, and the *Royal Family*. When the *Society* firſt addreſs'd themſelves to his *Majeſtie*, he was pleas'd to expreſs much ſatisfaction, that this enterprize was begun in *his Reign*: he then repreſented to them, the gravity, and difficulty of their work, and aſſur'd them of all the kind influence of his *Power*, and *Prerogative*. Since that he has frequently committed many things to their *ſearch*: he has referr'd many forein *Rarities* to their *inſpection*: he has recommended many domeſtick *improvements* to their care: he has demanded the reſult of their *trials*, in many appearances of *Nature*: he has been preſent, and aſſiſted with his own hands, at the performing of many of their *Experiments*; in his *Gardens*, his *Parks*, and on the *River*. And beſides I will not conceal, that he has ſometimes reprov'd them for the *ſlowneſs* of their *proceedings*: at which reproofs they have not ſo much cauſe to be afflicted, that they are the reprehenſions of a *King*, as to be comforted, that they are the reprehenſions of his *love*, and *affection* to their progreſs. For a Teſtimony of which *Royal benignity*, and to free them from all *hindrances*, and *occaſions* of *delay*, he has given them the eſtabliſhment of his *Letters Patents*, of which I will here produce an *Epitome*.

Charles

CHarles *the ſecond by the Grace of God, of* England, Scotland, France, *and* Ireland *King, Defender of the Faith,* &c. *To all unto whom theſe preſents ſhall come, Greeting. Having long reſolved within our ſelf to promote the welfare of Arts and Sciences, as well as that of our Territories and Dominions, out of our Princely affection to all kind of Learning, and more particular favour to Philoſophical Studies. Eſpecially thoſe which indeavour by ſolid Experiments either to reform or improve Philoſophy. To the intent therefore that theſe kinds of ſtudy, which are no where yet ſufficiently cultivated, may flouriſh in our Dominions; and that the Learned world may acknowledge us to be, not only the Defender of the Faith, but the Patron and Encourager of all ſorts of uſeful Knowledge.*

Know ye, that we out of our ſpecial Grace, certain knowledge, and meer motion, have given and granted, and do by theſe preſents give and grant for us, our Heirs, and Succeſſors, That there ſhall be for ever a Society conſiſting of a Preſident, Council, and Fellows, which ſhall be called by the name of the Preſident, Council, and Fellows of the Royal Society of London, *for and improving of Natural knowledge, of which Society we do by theſe preſents declare our ſelf to be Founder and Patron. And we do hereby make and conſtitute the ſaid Society by the name,* &c. *to be a Body corporate, to be continued under the ſame name in a perpetual ſucceſſion; And that they and their ſucceſſors (whoſe ſtudies are to be imployed for the promoting of the knowledge of natural things, and uſeful Arts by Experiments. To the glory of God, and the good of mankind) ſhall by the foreſaid name of Preſident, Council,* &c. *be inabled and made capable in Law, to levy, hold, poſſeſs, and injoy, Lands, Tenements,* &c. *Liberties, Franchiſes, Juriſdictions, for perpetuity,*

or

or Terms of Lives, or Years, or any other way: as alſo Goods, Chattels, and all other things of what Nature or Kind ſoever. And alſo by the name aforeſaid to Give, Grant, Demiſe, or Aſſign the ſaid Lands, Goods, &c. *and to do all things neceſſary thereabout. And the ſaid Perſons by the name aforeſaid are inabled to implead, be impleaded, ſue, defend,* &c. *in any Courts, and before any Judges, Officers,* &c. *whatſoever of the King, His Heirs and Succeſſors, in all and ſingular Actions Real and Perſonal: Pleas, Cauſes,* &c. *of what kind ſoever, as any of His Subjects within his Kingdom of* England, *or Corporations, are by Law capable and inabled to do.*

And the ſaid Preſident, Council, and Fellows are impowr'd to have a Common Seal for their uſe in their Affairs: and from time to time to break, change, and make anew the ſame, as ſhall ſeem expedient unto them.

And his Majeſty, in Teſtimony of his Royal Favour towards the ſaid Preſident, Council, and Fellows, and of His eſpecial eſteem of them, doth Grant a Coat of Arms to them and their Succeſſors, viz. *On a Field Argent a Canton of the three Lyons of* England: *For a Creſt, an Eagle proper on a Ducal Coronet ſupporting a Shield charged with the Lyons aforeſaid; and for Supporters, two Talbots with Coronets on their Necks. The ſaid Armes to be born,* &c. *by the ſaid Society upon all occaſions.*

And that His Majeſties Royal Intention may take the better effect for the good Government of the ſaid Society from time to time: It is eſtabliſh'd, That the Council aforeſaid ſhall conſiſt of 21 Perſons; (whereof the Preſident for the time being alwayes to be one.) And that all Perſons, which within two Moneths next enſuing the date of the ſaid Charter ſhall be choſen by the ſaid Preſident

ſident and Council; and in all times after the ſaid two Moneths, by the Preſident, Council, and Fellows [and noted in a Regiſter to be kept for that purpoſe] ſhall be Fellows of the ſaid Society, and ſo accounted, and call'd during life, except by the Statutes of the ſaid Society to be made any of them ſhall happen to be amoved. And by how much any Perſons are more excelling in all kinds of Learning, by how much the more ardently they deſire to promote the Honour, Buſineſs, and Emolument of the ſaid Society, by how much the more eminent they are for Integrity, Honeſty, Piety, Loyalty, and Good Affection toward His Majeſty, His Crown and Dignity; by ſo much the more fit and worthy ſuch Perſons are to be judged for reception into the Society.

And for the better execution of his Royal Grant, His Majeſty hath nominated, &c. *His Truſty and Well-beloved* William *Viſcount* Brouncker, *Chancellor to His deareſt Conſort Queen* Catharine, *to be the Firſt and Modern Preſident to continue in the ſaid Office from the date of the Patent to the Feaſt of Saint* Andrew *next enſuing, and until another Perſon of the ſaid Council be duly choſen into the ſaid Office. The ſaid Lord* Brouncker *being ſworn in all things belonging thereto well and faithfully to execute the ſaid Office before His right well-beloved and right Truſty Coſin and Counſellor,* Edward, *Earl of* Clarendon, *Lord High Chancellor of* England, *in the words following.*

I *William* Viſcount *Brouncker* do promiſe to deal faithfully and honeſtly in all things belonging to that Truſt committed to me, as Preſident of the *Royal Society* of *London*, for improving Natural Knowledge. So help me God.

And

And His Majeſty hath nominated, &c. *the Perſons following, His Truſty and Well beloved Sir* Robert Moray *Knight, one of His Privie Council in His Kingdom of* Scotland, Robert Boyl *Eſquire*, William Brereton *Eſquire, eldeſt Son to the Lord* Brereton, *Sir* Kenelme Digby *Knight, Chancellor to His deareſt Mother Queen* Mary, *Sir* Gilbert Talbot *Knight, Maſter of His Jewelhouſe, Sir* Paul Neile *Knight, one of the Uſhers of His Privie Chamber*, Henry Slingsby *Eſquire, one of the Gentlemen of His ſaid Privie Chamber, Sir* William Petty *Knight*, Timothy Clark *Doctor of Phyſick, and one of His Phyſitians*, John Wilkins *Doctor of Divinity*, George Ent *Doctor of Phyſick*, William Erskyne *Eſq; one of His Cupbearers*, Jonathan Goddard *Doctor of Phyſick*, William Ball *Eſquire*, Matthew Wren *Eſquire*, John Evelyn *Eſquire*, Thomas Henſhaw *Eſquire*, Dudley Palmer *of* Grayes-Inn *Eſquire*, Abraham Hill *of* London *Eſquire, and* Henry Oldenburg *Eſquire, together with the Preſident aforeſaid, to be the firſt and Modern* 21. *of the Council and Fellows of the Royal Society aforeſaid, to be continued in the Offices of the Council aforeſaid, from the date of the Patent to the Feaſt of Saint* Andrew *next following, and from thence till other fit perſons be choſen into the ſaid Offices. The ſaid Perſons to be ſworn before the Preſident of the Society, for the time being, well and truly to execute the ſaid Offices, according to the form and effect of the aforeſaid Oath to be adminiſtred to the Preſident by the Lord Chancellor as aforeſaid. For the adminiſtring which Oath to the ſaid Perſons, and all others hereafter from time to time to be choſen into the ſaid Council, full Power and Authority is Granted to the Preſident for the time being: And the ſaid Perſons duly ſworn, and all other from time to time duly choſen into the ſaid Coun-*

cil and ſworn, are to aid, adviſe and aſſiſt in all affairs, buſineſſes, and things concerning the better Regulation, Government, and Direction of the Royal Society; and every Member thereof.

Furthermore, Libertie is granted to the ſaid Society, lawfully to make and hold meetings of themſelves, for the ſearching out and diſcovery of Natural *Things, and Tranſaction of other buſineſſes relating to the ſaid Society, when and as often as ſhall be requiſite, in any Colledge, Hall, or other Convenient place in* London, *or within* 10. *Miles thereof.*

And Power is Granted to the ſaid Society, from time to time to nominate and chooſe yearly, on Saint Andrews *day, one of the Council aforeſaid, for the time being, to be Preſident of the Society until Saint* Andrews *day next enſuing (if he ſhall ſo long live, or not be removed for ſome juſt and reaſonable Cauſe) and from thence until another be choſen and put into the ſaid Office: the ſaid Preſident ſo elected, before admiſſion to that Office, to be ſworn before the Council, according to the form before expreſſed, who are impowr'd to adminiſter the ſaid Oath from time to time, as often as there ſhall be cauſe to chooſe a Preſident.*

And in Caſe that the ſaid Preſident, during his Office, ſhall die, recede, or be removed; then, and ſo often, it ſhall be Lawful for the Council of the Royal Society, to meet together to chooſe one of their Number for Preſident of the ſaid Society, and the Perſon ſo choſen and duly ſworn, ſhall have and exerciſe the Office of Preſident for the remainder of the year, and until another be duly choſen into the ſaid Office.

And in caſe that any one or more of the Council aforeſaid ſhall die, recede, or be remov'd (which perſons or any of them, for miſdemeanour, or other reaſonable cauſe, are declar'd

declar'd to be amovable by the Preſident and the reſt of the Council) then and ſo often it ſhall be lawful for the Preſident, Council, and Fellows, to chooſe one or more of the Fellows of the Royal Society in the room of him or them ſo deceaſing, receding, or removed, to compleat the aforeſaid number of 21. *of the Council, which Perſon or Perſons, ſo choſen, are to continue in Office until Saint* Andrews *day then next enſuing, and until others be duly choſen, the ſaid Perſons being ſworn, faithfully to execute their Offices, according to the true intention of the Patent.*

And His Majeſtie doth will and Grant unto the ſaid Preſident, Council, and Fellows, full power and authority on Saint Andrews *day yearly, to elect, nominate, and change* 10. *of the Fellows of the Royal Society, to ſupply the places and Offices of ten of the aforeſaid number of* 21. *of the Council, declaring it to be His Royal Will and Pleaſure, that ten and no more of the Council aforeſaid be annually changed and removed by the Preſident, Council, and Fellows aforeſaid.*

And it is Granted on the behalf of the ſaid Society that if it ſhall happen, that the Preſident to be ſick, infirm, detained in His Majeſties Service, or otherwiſe occupied, ſo as he cannot attend the neceſſary Affairs of the Society, then and ſo often it ſhall be lawful for him to appoint one of the Council for his Deputy, who ſhall ſupply his place from time to time, as often as he ſhall happen to be abſent during the whole time of the ſaid Preſidents continuance in his Office, unleſs he ſhall in the mean time conſtitute ſome other of the Council for his Deputy: And the Deputy ſo conſtituted is impowr'd to do all and ſingular things which belong to the Office of the Preſident of the Royal Society, and in as ample manner and form as the ſaid Preſident may do by vertue of

His Majeſties Letters Patents, He the ſaid Deputy being duly ſworn before the Council in form before ſpecified, who are impowr'd to adminiſter the Oath as often as the caſe ſhall require.

It is further granted to the Society, to have one Treaſurer, two Secretaries, two or more Curators of Experiments, one or more Clerk or Clerks, and alſo two Sergeants at Mace, who may from time to time attend on the Preſident: all the ſaid Officers to be choſen by the Preſident, Council and Fellows, and to be ſworn in form and effect before ſpecified, well and faithfully to execute their Offices, which Oath the Council are impowr'd to adminiſter: And His Majeſty nominates and appoints His well-beloved Subjects, the aforeſaid William Ball *Eſquire, to be the firſt and Modern Treaſurer; and the aforeſaid* John Wilkins *and* Henry Oldenburg, *to be the firſt and Modern Secretaries of the Royal Society, to be continued in the ſaid Offices to the Feaſt of Saint* Andrew *next following the date of the Patent. And that from time to time, and ever hereafter, on the ſaid Feaſt of Saint* Andrew *(if it be not Lords day, and if it be Lords day, on the next day after) the Preſident, Council, and Fellows aforeſaid, are impowr'd to nominate and chooſe honeſt and diſcreet Men for Treaſurer and Secretaries, which are to be of the Number of the Council of the Royal Society, which Perſons Elected and ſworn, in form before ſpecified, are to exerciſe and enjoy the ſaid Offices until the Feaſt of Saint* Andrew *then next following.*

And if it ſhall happen, that the aforeſaid Elections of the Preſident, Council, Treaſurer, and Secretaries, or any of them, cannot be made or perfected on the Feaſt of Saint Andrew *aforeſaid: it is granted to the aforeſaid Preſident, Council, and Fellows, that they may lawfully nominate and aſſign another day, as neer to the ſaid Feaſt of Saint* Andrew *as conveniently may be, for making or perfecting*

perfecting the ſaid Elections, and ſo from day to day till the ſaid Elections be perfected.

And in caſe that any of the aforeſaid Officers of the Royal Society ſhall die, recede, or be remov'd from their reſpective Offices, then and ſo often it ſhall be lawful for the ſaid Preſident, Council, and Fellows, to chooſe one or more into the Office or Offices vacant, to hold the ſame during the reſidue of that year, and until others be duly choſen and ſworn in their places.

Moreover, on the behalf of the Society, it is granted unto the Preſident and Council, that they may aſſemble and meet together in any Colledge, Hall, or other convenient place in London, *or within ten miles thereof (due and lawful ſummons of all the Members of the Council to extraordinary meetings being always premiſed) and that they being ſo met together, have full power and authority from time to time, to make, conſtitute, and eſtabliſh ſuch Laws, Statutes, Orders, and Conſtitutions, which ſhall appear to them to be good, uſeful, honeſt, and neceſſary, according to their judgments and diſcretions, for the Government, Regulation and Directions of the Royal Society, and every Member thereof: And to do all things concerning the Government, Eſtate, Goods, Lands, Revenues, as alſo the Buſineſſes and Affairs of the ſaid Society: All which Laws, Statutes, Orders, &c ſo made, His Majeſty wills and commands, that they be from time to time inviolably obſerved, according to the tenor and effect of them: Provided that they be reaſonable and not repugnant or contrary to the Laws, Cuſtoms, &c. of his Kingdom of* England.

And furthermore, full Power and Authority is given and granted unto the ſaid Society, from time to time to chooſe one or more Printers and Gravers, and by writing ſealed with the Common Seal of the Society, and ſigned by the Preſident for the time being, to grant them power to print ſuch things, matters and buſineſſes concerning the ſaid

ſaid Society, as ſhall be committed to them by the Council from time to time; The ſaid Printers and Gravers being ſworn before the Preſident and Council in form before ſpecified, which Preſident and Council are impowred to give the ſaid Oath.

And for the greater advantage and ſucceſs of the Society in their Philoſophical Studies and Indeavours, full Power and Authority is granted unto them, to require, take, and receive, from time to time, dead bodies of Perſons executed, and the ſame to anatomize, to all intents and purpoſes, and in as ample manner and form as the Colledge of Phyſitians, and Company of Chirurgions of London *(by what names ſoever the ſaid two Corporations are or may be called) have had and made uſe of, or may have and uſe the ſaid Bodies.*

And for the improvement of ſuch Experiments, Arts, and Sciences as the Society may be imploy'd in, full Power and Authority is granted unto them from time to time by Letters under the hand of the Preſident in the preſence of the Council, to hold Correſpondence and Intelligence with any Strangers, whether private Perſons, or Collegiate Societies or Corporations, without any Interruption or Moleſtation whatſoever: Provided that this Indulgence or Grant be extended to no further uſe than the particular Benefit and Intereſt of the Society, in Matters Philoſophical, Mathematical, and Mechanical.

Full Power and Authority is alſo granted on the behalf of the Society to the Council, to erect and build one or more Colledges within London, *or ten miles thereof, of what form or quality ſoever, for Habitation, Aſſembling, or Meeting of the Preſident, Council and Fellows, about any affairs and buſineſſes of the Society.*

And if any abuſes or differences ſhall ever hereafter ariſe

ariſe and happen about the Government or Affairs of the Society, whence the Conſtitution, Progreſs, and Improvement, or Buſineſſes thereof may ſuffer or be hindred: In ſuch caſes His Majeſty Aſſignes and Authorizes His right Truſty and right Well-beloved Coſen and Counſellor, Edward *Earl of* Clarendon *Lord High Chancellor of* England, *by himſelf during his life, and after his deceaſe the Lord Arch-biſhop of* Canterbury, *the Lord Chancellor, or Lord Keeper of the Great Seal of* England, *the Lord High Treaſurer of* England, *the Lord Keeper of the Privy Seal, the Lord Biſhop of* London, *and the two principal Secretaries of State for the time being, or any four or more of them, to compoſe and redreſs any ſuch differences or abuſes.*

And laſtly, His Majeſty ſtraightly charges and commands all Juſtices, Mayors, Aldermen, Sheriffs, Bayliffs, Conſtables, and all other Officers, Miniſters, and Subjects whatſoever, from time to time to be aiding and aſſiſting unto the ſaid Preſident, Council, and Fellows of the Royal Society, in and about all things, according to the true intention of His Letters Patents.

This is the *Legal Ratification* which the *Royal Society* has receiv'd. And in this place I am to render their publick thanks to the Right Honourable the *Earl of Clarendon* Lord Chancellor of *England*, to Sir *Jeffery Palmer* Atturny General, and to Sir *Heneage Finch* Sollicitor General: who by their cheerful concurrence, and free promotion of this Confirmation, have wip'd away the aſperſion, that has been ſcandalouſly caſt on the *Profeſſion* of the *Law*, that it is an Enemy to *Learning*, and the *Civil Arts*. To ſhew the falſehood of this reproach, I might inſtance in many *Judges* and *Counſellors* of all Ages, who have been the

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ornaments of the *Sciences*, as well as of the *Bar*, and *Courts* of *Juſtice*. But it is enough to declare, that my Lord *Bacon* was a *Lawyer*, and that theſe eminent *Officers* of the *Law*, have compleated this foundation of the *Royal Society*: which was a work well becoming the largeneſs of his Wit to deviſe, and the greatneſs of their Prudence to eſtabliſh.

Sect. XXVI. *Their Councils and Statutes.*

According to the intention of theſe *Letters Patents*, their *Council* has ever ſince been annually renew'd: their *Preſident*, their *Treaſurer*, their *Secretaries* choſen: The chief employments of the *Council* have been to manage their *Political affairs*, to regulate diſorders, to make addreſſes, and applications in their behalf; to guard their *Priviledges*, to diſperſe *correſpondents*, but Principally to form the Body of their *Statutes*, which I will here inſert.

An Abſtract of the Statutes of the Royal Society.

WHatever Statute ſhall be made, or repeal'd, the making or repealing of it ſhall be voted twice, and at two ſeveral meetings of the Council.

This Obligation ſhall be ſubſcrib'd by every Fellow; or his election ſhall be void.

WE who have hereto ſubſcrib'd, do promiſe each for himſelf, that we will indeavour to promote the good of the Royal Society of *London*, for the Improvement of Natural Knowledge, and to purſue the ends, for which the ſame was founded: that we will

will be preſent at the Meetings of the Society, as often as conveniently we can: eſpecially at the anniverſary Elections, and upon extraordinary occaſions: and that we will obſerve the Statutes and Orders of the ſaid Society: Provided, that whenever any of us ſhall ſignifie to the Preſident under his hand, that he deſires to withdraw from the Society, he ſhall be free from this Obligation for the future.

Every Fellow ſhall pay his admiſſion money, and afterwards contribution towards the defraying of the charges of Obſervations and Experiments, &c.

The ordinary meetings of the Royal Society ſhall be held once a week, where none ſhall be preſent, beſides the Fellows, without the leave of the Society, under the degree of a Baron in one of His Majeſties three Kingdoms, or of His Majeſties Privie Council; or unleſs he be an eminent Forreigner, and theſe only without the leave of the Preſident.

The buſineſs of their weekly Meetings ſhall be, To order, take account, conſider, and diſcourſe of Philoſophical Experiments, and Obſervations: to read, hear, and diſcourſe upon Letters, Reports, and other Papers, containing Philoſophical matters, as alſo to view, and diſcourſe upon the productions and rarities of Nature, and Art: and to conſider what to deduce from them, or how they may be improv'd for uſe, or diſcovery.

The Experiments that be made at the charge of the Society. Two Curators at leaſt ſhall be appointed for the Inſpection of thoſe which cannot be perform'd before the Society: by them the bare report of matter of Fact ſhall be ſtated and return'd.

The Election of Fellows ſhall be made by way of Ballet: and their Admiſſion by a ſolemn Declaration made by the Preſident of their Election.

The Election of the Council and Officers ſhall be made once a year: Eleven of the preſent Council ſhall be continued, by Lot, for the next year, and ten new Ones choſen, in like manner. Out of this new Council ſhall be elected a Preſident, Treaſurer, and two Secretaries, in the ſame way.

The Preſident ſhall preſide in all meetings, regulate all debates of the Society, and Council; ſtate, and put Queſtions; call for Reports, and Accounts from Committees, Curators, and others; ſummon all extraordinary meetings upon urgent occaſions; and ſee to the execution of the Statutes. The Vice-Preſident ſhall have the ſame power in the abſence of the Preſident.

The Treaſurer, or his Deputy, ſhall receive and keep Accounts of all money due to the Society, and diſburſe all money payable by the Society. He ſhall pay ſmall ſums by order of the Preſident under his hand, but thoſe that exceed five pounds, by order of the Council. All Bills of charges for Experiments ſhall firſt be ſign'd by the Curators. The Accounts of the Treaſurer ſhall be Audited four times a year, by a Committee of the Council, and once a year by a Committee of the Society.

The Secretaries are to take Notes of the Orders, and material paſſages of the Meetings; to take care of the Books, Papers, and Writings of the Society; to order, and direct the Clerks in making Entries of all matters in the Regiſter, and Journal-Books of the Society, or Council; to draw up ſuch Letters as ſhall be written in their Name, which ſhall be approv'd at one of their Meetings; to give notice of the Candidates propounded in order to Election.

The Curators by Office ſhall have a ſufficient allowance for their incouragement, which ſhall increaſe proportionably with the revenue of the Society; provided that it exceed

exceed not two hundred pounds a year. *They ſhall be well ſkilled in Philoſophical, and Mathematical Learning, well vers'd in Obſervations, Inquiries, and Experiments of Nature and Art. They ſhall take care of the managing of all Experiments, and Obſervations appointed by the Society, or Council, and report the ſame, and perform ſuch other tasks, as the Society, or Council ſhall appoint: ſuch as the examining of Sciences, Arts, and Inventions now in uſe, and the bringing in Hiſtories of Natural and Artificial things,* &c. *They ſhall be propounded at leaſt a month before they are choſen. They ſhall be examin'd by the Council before the election: To their Election every Member of the Society ſhall be ſummon'd: They ſhall at firſt be only elected for a year of probation, (except they be of known merits) at the end of the year, they ſhall be either elected for perpetuity, or for a longer time of probation, or wholly rejected. The cauſes of ejecting a Curator ſhall be the ſame with ejecting a Fellow, or for fraudulent dealing, and negligence in the affairs of the Society; provided that he ſhall firſt receive three reſpective admonitions. If any Curator ſhall be diſabled by Age, Infirmity, or any Caſualty, in the ſervice of the Society, ſome proviſion ſhall be made for him during life, if his condition requires, according as the Council ſhall think fit.*

The Clerk ſhall conſtantly attend at all Meetings: he ſhall follow the directions of the Secretaries, in Regiſtring, and entring all matters that ſhall be appointed: he ſhall not communicate any thing contain'd in their Books to any that is not a Fellow. He ſhall have a certain rate for what he copies, and a yearly ſtipend for his attendance.

The Printer ſhall take care for the printing of ſuch Books as ſhall be committted to him by order of the

Society, or Council; and therein he ſhall obſerve their directions, as to the correction of the Edition, the number of Copies, the form, or volume, &c.

The Operators of the Society, when they have any of their Work under their hands, ſhall not undertake the work of any other perſons, which may hinder the buſineſs of the Society. They ſhall have Salaries for their attendance.

The Common Seal of the Society, ſhall be kept in a Cheſt with three Locks, and three different Keys, by the Preſident, Treaſurer, and one of the Secretaries. The Deeds of the Society, ſhall be paſs'd in Council, and ſeal'd by them and the Preſident.

The Books that concern the affairs of the Society, ſhall be the Charter Book; Statute Book, Journal Books, Letter Books, and Regiſter Books, for the entring of Philoſophical Obſervations, Hiſtories, Diſcourſes, Experiments, Inventions.

The names of Benefactors ſhall be honourably mention'd in a Book provided for that purpoſe.

In caſe of Death, or Receſs of any Fellow, the Secretaries are to note it in the Margent of the Regiſter, over againſt their names.

The cauſes of Ejection ſhall be contemptuous diſobedience to the Statutes and Orders of the Society; defaming, or malicious damnifying the ſame. This ſhall be declar'd by the Preſident at one of the Meetings; and the Ejection recorded.

When theſe *Statutes* were preſented to his *Majeſty*, he was pleas'd to ſuperſcribe himſelf, their *Founder*, and *Patron*, his *Royal Highneſs*, and his *Highneſs Prince Rupert*, at the ſame time, declaring themſelves *Fellows*.

Nor

Nor has the *King* only incourag'd them, by kindneſs of *words*, and by *Acts* of *State*: but he has alſo provok'd them to unwearied activity in their *Experiments*, by the moſt effectual means of his *Royal Example*. There is ſcarce any one ſort of *work*, whoſe advancement they regard, but from his *Majeſties* own labours, they have receiv'd a *pattern* for their indeavours about it. They deſign the multiplying, and beautifying of *Mechanick Arts*: And the noiſe of *Mechanick Inſtruments* is heard in *Whitehall* it ſelf. They intend the perfection of *Graving*, *Statuary*, *Limning*, *Coining*, and all the works of Smiths, in Iron, or Steel, or Silver: And the moſt excellent *Artiſts* of theſe kinds, have proviſion made for their practice, even in the Chambers, and Galleries of his *Court*. They purpoſe the trial of all manner of *operations by fire*: And the *King* has under his own roof found place for *Chymical Operators*. They reſolve to reſtore, to enlarge, to examine *Phyſick*: And the *King* has indow'd the Colledge of *London* with new Priviledges, and has planted a Phyſick Garden under his own eye. They have beſtow'd much conſideration, on the *propagating of Fruits and Trees*; And the *King* has made *Plantations* enough, even almoſt to repair the ruines of a Civil War. They have begun an exact *Survey of the Heavens*: and Saint *Jameſes Park* may witneſs, that *Ptolomey* and *Alphonſo* were not the only *Monarchs*, who obſerv'd the motions, and appearances of the *Stars*. They have ſtudied the promoting of *Architecture* in our Iſland: and the beauty of our late *Buildings*, and the reformation of his own Houſes, do ſufficiently manifeſt his Skill and Inclination to that *Art*: of which magnificence, we had ſeen more effects.

Sect. XXVII *The Kings Example in promoting Experiments.*

fects ere this, if he had not been call'd off by this War, from houſes of *convenience*, to thoſe of *ſtrength*. They have principally conſulted the advancement of *Navigation*: And the *King* has been moſt ready to reward thoſe, that ſhall diſcover the *Meridian*. They have employ'd much time in examining *the Fabrick of Ships*, the forms of their *Sails*, the ſhapes of their *Keels*, the ſorts of Timber, the planting of Firr, the bettering of Pitch, and Tarr, and Tackling. And in all *Maritime* affairs of this Nature, his *Majeſty* is acknowledg'd to be the beſt *Judge* amongſt Seamen, and Shipwrights, as well as the moſt powerful amongſt *Princes*.

§. XXVIII. *And the preſent Genius of our Nation.*

By theſe, and many other inſtances it appears, that the *King* has not only given ſuccour to the *Royal Society*, in the proſecution of their *labours*; but has alſo led them on in their *way*, and trac'd out to them the paths, in which they ought to tread. And with this propitious inclination of his *Majeſtie*, and the higheſt *Degrees* of men, the *Genius* of the *Nation* it ſelf irreſiſtibly conſpires. If we reflect on all the paſt times of *Learning* in our *Iſland*; we may ſtill obſerve ſome remarkable *accidents*, that retarded theſe *ſtudies*, which were ſtill ready to break forth, in ſpight of all oppoſition.

Till the union of the two houſes of *York*, and *Lancaſter*, the whole force of our *Country* was ingag'd in Domeſtick Wars, between the *King*, and the *Nobility*, or in the furious contentions between the divided Families: unleſs ſometimes ſome magnanimous *Prince*, was able to turn their ſtrength, to forreign conqueſts. In King *Henry the ſeventh*, the two *Roſes* were joyn'd. His Government was like his own temper,

temper, *close*, *severe*, *jealous*, *avaricious*, and withall *victorious*, and *prudent*: but how unprepar'd his time was for new discoveries, is evident by the slender account that he made of the proposition of *Columbus*. The Reign of King *Henry the eighth*, was *vigorous*, *haughty*, *magnificent*, *expensive*, *learned*. But then the alteration of *Religion* began, and that alone was then sufficient to possess the minds of men.

The *Government* of King *Edward the sixth* was contentious, by reason of the factions of those who manag'd his childhood: and the shortness of his life depriv'd us of the fruits, that might have been expected, from the prodigious beginnings of the *King* himself. That of *Queen Mary* was *weak*, *melancholy*, *bloody* against the Protestants, obscur'd by a forreign Marriage, and unfortunate by the loss of *Calais*. That of *Queen Elizabeth* was *long*, *triumphant*, *peaceable* at home, and *glorious* abroad. Then it was shewn, to what height the *English* may rise, when they are commanded by a *Prince*, who knows how to govern their hearts, as well as hands. In her dayes the *Reformation* was setled, commerce was establish'd, and *Navigation* advanc'd. But though knowledge began abundantly to spring forth, yet it was not then seasonable for *Experiments* to receive a *publick incouragement*: while the writings of antiquity, and the controversies between us, and the Church of *Rome*, were not fully studied, and dispatch'd.

The *Reign* of *King James* was happy in all the benefits of *Peace*, and plentifully furnish'd with men of profound *Learning*. But in imitation of the *King*, they chiefly regarded the matters of *Religion*, and *Disputation*: so that even my Lord *Bacon*, with all his authority in the State, could never raise any *Colledge*

of

of Salomon, but in a *Romance*. That of *King Charles the Firſt*, began indeed to be ripe for ſuch undertakings, by reaſon of the plenty, and felicity of the firſt years of his *Government*, and the abilities of the *King* himſelf: who was not only an inimitable *Maſter*, in *reaſon* and *eloquence*, but excell'd in very many practical *Arts*, beyond the uſual cuſtome of *Kings*, nay even beyond the skill of the beſt *Artiſts* themſelves. But he alas! was call'd away from the ſtudies of *quiet*, and *peace*, to a more dangerous, and a more honourable reputation. The chief Triumphs that Heaven reſerv'd for him, were to be gather'd from his *ſuffering virtues*, in them he was only exceeded, by his Divine Example of our *Saviour*: in imitation of whoſe Paſſion, thoſe afflictions, and thoſe thorns which the rude Souldiers deſign'd for his *diſgrace*, and *torment*, became his *glory*, and his *Crown*.

The late times of *Civil War*, and *confuſion*, to make recompenſe for their infinite calamities, brought this advantage with them, that they ſtirr'd up mens minds from *long eaſe*, and a *lazy reſt*, and made them *active*, *induſtrious* and *inquiſitive*: it being the uſual benefit that follows upon *Tempeſts*, and *Thunders* in the *State*, as well as in the *Skie*, that they purifie, and cleer the *Air*, which they diſturb. But now ſince the *Kings* return, the blindneſs of the former *Ages*, and the miſeries of this laſt, are vaniſh'd away: now men are generally weary of the *Relicks* of *Antiquity*, and ſatiated with *Religious Diſputes*: now not only the *eyes* of men, but their *hands* are open, and prepar'd to *labour*: Now there is a univerſal *deſire*, and *appetite* after *knowledge*, after the peaceable, the fruitful, the nouriſhing *Knowledge*: and not after that of antient Sects, which only yielded hard indigeſtible *arguments*,

or

or ſharp *contentions* inſtead of *food:* which when the minds of men requir'd *bread*, gave them only a *ſtone*, and for *fiſh* a *ſerpent*.

Whatever they have hitherto attempted, on theſe Principles, and incouragements, it has been carry'd on with a vigorous ſpirit, and wonderful good Fortune, from their firſt conſtitution, down to this day. Yet I overhear the whiſpers, and doubts of many, who demand, what they have done all this while? and what they have produc'd; that is anſwerable to theſe mighty hopes, which we indeavour, to make the world conceive of their undertaking? Sect. XXIX. *The ſubjects about which they have been emploi'd.*

If thoſe who require this Account, have themſelves perform'd any worthy things, in this ſpace of time; it is fit, that we ſhould give them ſatisfaction. But they who have done nothing at all, have no reaſon to upbraid the *Royal Society*, for not having done as much, as they fancy it might. To thoſe therefore who excite it to work, by their examples, as well as words and reproofs, methinks it were a ſufficient Anſwer, if I ſhould only repeat the particulars, I have already mention'd, wherein the *King* has ſet on foot a *Reformation*, in the Ornaments, and Advantages of our Country. For though the original praiſe of all this is to be aſcrib'd to the Genius of the *King* himſelf: yet it is but juſt, that ſome honour ſhould thence deſcend to this Aſſembly, whoſe purpoſes are conformable to his Majeſties performances of that Nature: Seeing all the little ſcandals, that captious humours have taken againſt the *Royal Society*, have not riſen from their general proceedings; but from a few pretended offences, of ſome of their private Members: it is but reaſon, that we ſhould alledge in their

commendation, all the excellent Deſigns, which are begun by the *King*, who has not only ſtil'd himſelf their *Founder*, but acted as a particular *Member* of their Company.

To this I will alſo add, that in this time, they have paſs'd through the firſt difficulties of their *Charter*, and Model: and have overcome all oppoſitions, which are wont to ariſe, againſt the beginnings of great things. This certainly alone were enough to free them from all imputation of idleneſs, that they have fram'd ſuch an Aſſembly in ſix years, which was never yet brought about in ſix thouſand. Beſides this the world is to conſider, that if any that think, the whole compaſs of their work might have come to a ſudden iſſue: they ſeem neither to underſtand the intentions of the *Royal Society*, nor the extent of their taſk. It was never their aim, to make a violent diſpatch. They know that precipitancy in ſuch matters, was the fault of the Antients: And they have no mind, to fall into the ſame error, which they indeavour to correct. They began at firſt on ſo large a Bottom, that it is impoſſible, the whole Frame ſhould be ſuddenly compleated. 'Tis true, they that have nothing elſe to do, but to expreſs, and adorn concluſions of Knowledge already made, may bring their Arts to an end, as ſoon as they pleaſe. But they who follow the ſlow, and intricate method of Nature, cannot have the ſeaſons of their productions, ſo much in their own power. If we would alwayes exact from them, daily or weekly harveſts; we ſhould wholly cut off the occaſions of very many excellent Inventions, whoſe ſubjects are remote, and come but ſeldome under their conſideration. If we ſhould require them, immediately to reduce all their labours, to publick, and conſpicuous

ous uſe, by this dangerous ſpeed, we ſhould draw them off from many of the beſt Foundations of Knowledge. Many of their nobleſt diſcoveries, and ſuch as will hereafter prove moſt ſerviceable, cannot inſtantly be made to turn to profit. Many of their weightieſt, and moſt precious *Obſervations*, are not alwayes fit to be expos'd to open view: For it is with the greateſt Philoſophers, as with the richeſt Merchants, whoſe Wares of greateſt bulk and price, lie commonly out of ſight, in their Warehouſes, and not in their Shops.

This being premis'd, I will however venture to lay down a brief draught of their moſt remarkable particulars: which may be reduc'd to theſe following heads: The Queries, and Directions, they have given abroad: the Propoſals, and Recommendations they have made: the Relations they have receiv'd: the Experiments they have try'd: the Obſervations they have taken: the Inſtruments they have invented: the Theories that have been propoſed: the Diſcourſes they have written, or publiſh'd: the Repoſitory, and Library: and the Hiſtories of Nature, and Arts, and Works, they have collected.

Sect. XXX. *Their Queries, and Directions.*

Their manner of gathering, and diſperſing *Queries* is this. Firſt they require ſome of their particular Fellows, to examine all Treatiſes, and Deſcriptions, of the Natural, and Artificial productions of thoſe Countries, in which they would be inform'd. At the ſame time, they employ others to diſcourſe with the Seamen, Travellers, Tradeſmen, and Merchants, who are likely to give them the beſt light. Out of this united Intelligence from Men and Books, they compoſe a Body of Queſtions, concerning all

the obſervable things of thoſe places. Theſe Papers being produc'd in their weekly Aſſemblies, are augmented, or contracted, as they ſee occaſion. And then the Fellows themſelves are wont to undertake their diſtribution into all Quarters, according as they have the convenience of correſpondence: of this kind I will here reckon up ſome of the Principal, whoſe Particular heads are free to all, that ſhall deſire Copies of them for their Direction.

They have compos'd Queries, and Directions, what things are needful to be obſerv'd, in order to the making of a Natural Hiſtory in general: what are to be taken notice of towards a perfect Hiſtory of the Air, and Atmoſphere, and Weather: what is to be obſerv'd in the production, growth, advancing, or transforming of Vegetables: what particulars are requiſite, for collecting a compleat Hiſtory of the Agriculture, which is us'd in ſeveral parts of this Nation.

They have preſcrib'd axact Inquiries, and given punctual Advice for the tryal of Experiments of rarefaction, refraction, and condenſation: concerning the cauſe, and manner of the Petrifaction of Wood: of the Loadſtone: of the Parts of Anatomy, that are yet imperfect: of Injections into the Blood of Animals; and Transfuſing the blood of one Animal into another: of Currents: of the ebbing, and flowing of the Sea: of the kinds, and manner of the feeding of Oyſters: of the Wonders, and Curioſities obſervable in deep Mines.

They have Collected, and ſent abroad Inquiries for the *Eaſt Indies*, for *China*, for *St. Helena*, for *Tenariff*, or any high Mountain, for *Ginny*, for *Barbary*, and *Morocco*,

Morocco, for *Spain*, and *Portugal*, for *Turky*, for *France*, for *Italy*, for *Germany*, for *Hungary*, for *Transylvania*, for *Poland*, and *Sueden*, for *Iceland*, and *Greenland*. They have given Directions for Seamen in General, and for observing the Eclipses of the Moon; for observing the Eclipses of the Sun by *Mercury*, in several parts of the World, and for observing the *Satellites* of *Jupiter*.

Of this their way of Inquiring, and giving Rules for direction, I will here produce a few Instances: from whose exactness it may be ghess'd, how all the rest are perform'd.

AN-

ANSWERS

RETURN'D BY

Sir *PHILIBERTO VERNATTI*
Reſident in *Batavia* in *Java Major*,
To certain Inquiries ſent thither by Order of the *Royal Society*, and recommended by
Sir *ROBERT MORAY*.

Q. 1. *Whether Diamonds and other Precious Stones grow again after three or four years, in the ſame places where they have been digged out?*

A. Never, or at leaſt as the memory of man can attain to.

Q. 2. *Whether the Quarries of Stone in* India, *neer* Fetipoca, *not far from* Agra, *may be cleft like Logs, and ſawn like Planks, to ciel Chambers, and cover Houſes.*

A. What they are about the Place mentioned, I have not as yet been well informed; but in *Perſia* not far from *Cyrus* where the beſt Wine groweth, there is a ſort of hard Stone which may be cleft like Firr-wood, as if it had a grain in it: the ſame is at the Coaſt *Cormandel* about *Sadraſpatuam*; where they make but a mark in the Stone, ſet a wedge upon it, with a wooden hammer, as thick and thin as they pleaſe; it is uſed commonly for pavement in houſes, one foot ſquare, and ſo cheap, that ſuch a ſtone finely poliſh'd coſts not above ſix pence.

Q. 3.

Q. 3. *Whether there be a Hill in* Sumatra *which burneth continually, and a Fountain which runneth pure Balſom.*

A. There is a Hill that burneth in *Sumatra* neer *Endrapoer*; but I cannot hear of any ſuch Fountain; and I believe that the like Hill is upon *Java Major* oppoſite to *Batavia*: for in a clear morning or evening, from the Road a man may perfectly perceive a continual ſmoak riſe from the top and vaniſh by little and little. I have often felt Earthquakes here, but they do not continue long; in the year 1656. or 57. (I do not remember well the time) *Batavia* was cover'd in one afternoon, about two of the Clock, with a black duſt, which being gathered together, was ſo ponderous, that it exceeded the weight in Gold. I, at that time, being very ill, did not take much notice of it, but ſome have gathered it, and if I light upon it ſhall ſend you ſome. It is here thought, it came out of the Hill: I never heard of any that had been upon this Hills top: *Endrapeor* is counted a mighty unwholſome place, as likewiſe all others where Pepper grows; as *Jamby Banjar*, *Balingtoan*, *&c.* though ſome impute it to the Hills burning.

As for the Fountain it is unknown to us, except *Oleum Terræ* is meant by it, which is to be had in *Sumatra*, but the beſt comes from *Pegu*.

Q. 4. *What River is that in* Java Major *that turns Wood into Stone?*

A. There is none ſuch to our knowledge; yet I have ſeen a piece of Wood with a Stone at the end of it; which was told me, that was turned into Stone by a River in *Pegu*; but I took it but for a Foppery; for divers *Arbuſta* grow in Rocks, which being appro-

priated

priated curiouſly, may eaſily deceive a too haſty believer.

Q. 5. *Whether it be true, that upon the Coaſt of* Achin *in* Sumatra, *the Sea, though it be calm, groweth very high when no rain falls, but is ſmooth in rain, though it blows hard.*

A. Sometimes, but not alwayes; the Reaſon is this, that *Achin* lieth at the very end and corner of *Sumatra*, as may be ſeen by the Map, open in the main Ocean, ſo that the Sea comes rowling from the *Cabo de bona Eſperanca*, and all that way unto it, and it is natural to the Sea to have a continual motion, let it be never ſo calm; which motion cannot be called a Wave, neither have I any Engliſh for it at preſent, but in Dutch we call it, *Deyninge van Dee Zee*, and the calmer it is, the higher; the natural motion of the Sea elevates very ſlowly the water; ſo that I have ſeen Ships and Junks toſſed by theſe *Deynings* in a calm, (when there is ſcarce wind enough to drive a bubble) that a man can ſcarce ſtand in them; ſome ſay this motion proceeds from boyſterous winds at Sea far diſtant. That rain beats down the ſwelling of theſe *Deynings* (eſpecially if it be vehement) proceeds naturally from its weight and impetuoſity. And it is obſerved, that about *Achin* the Mountains are high and ſteep, from whoſe tops boyſterous, called *Travant*, come ſuddenly (like a Granado caſt) falling into the Sea, are accompanied commonly with a great ſhower of rain, and laſt not above a quarter, or at the moſt, half an hour, which is too ſhort a time to diſturb the Sea, or to cauſe a contrary motion in it, being ſhelter'd by theſe Mountains.

Q. 6. *Whether in the Iſland of* Sambrero, *which lyeth Northwards of* Sumatra, *about eight degrees Northern*

thern latitude, there be found ſuch a Vegetable as Maſter James Lancaſter *relates to have ſeen, which grows up to a Tree, ſhrinks down when one offers to pluck it up into the ground, and would quite ſhrink unleſs held very hard? And whether the ſame, being forcibly pluck'd up, hath a worm for its root, diminiſhing more and more; according as the Tree groweth in greatneſs; and as ſoon as the Worm is wholly turned into the Tree, rooting in the ground, and ſo growing great? And whether the ſame plucked up young turns, by that time it is dry, into a hard Stone, much like to white Corral.*

A. I cannot meet with any that ever have heard of ſuch a Vegetable.

Q. 7. *Whether thoſe Creatures that are in theſe parts plump and in ſeaſon at the full Moon, are lean and out of ſeaſon at the new, find the contrary at the* Eaſt-Indies.

A. I find it ſo here, by Experience at *Batavia*, in Oyſters and Crabs.

Q. 8. *What ground there may be for that Relation, concerning Horns taking root, and growing about* Goa?

A. Inquiring about this, a Friend laught, and told me it was a Jeer put upon the *Portuges*, becauſe the Women of *Goa* are counted much given to lechery.

Q. 9. *Whether the* Indians *can ſo prepare that ſtupifying Herb* Datura, *that they make it lye ſeveral dayes, months, years, according as they will have it, in a mans body, without doing him any hurt, and at the end kill him, without miſſing half an hours time?*

A. The *China* men in this place, have formerly uſed *Datura* as a Fermentation, to a ſort of Drink much beloved by the Souldiers and Mariners, called *Suyker-*

bier, which makes them raging mad, ſo that it is forbidden ſtrictly under the penalty of a great pain to make uſe of the ſame.

Q. 10. *Whether thoſe that be ſtupified by the juyce of this Herb* Datura, *are recovered by moyſtning the ſoles of their feet in fair water?*

A. No. For I have ſeen divers Souldiers and Mariners fall into the Rivers and Ditches, being ſtupified by their drink aforeſaid, who were rather worſe after they were taken out, than better.

Q. 11. *Whether a* Betel *hath ſuch contrariety to the* Durion, *that a few leaves thereof put to a whole Shopful of* Durions, *will make them all rot ſuddenly? And whether thoſe who have ſurfeited on* Durions, *and thereby overheated themſelves, do by laying one leaf of* Betel *cold upon the heart, immediately cure the Inflammations, and recover the Stomach? This* Betel *being thought to preſerve thoſe* Indians *from Tooth-ach, looſe Gums, and Scurvey, and from ſtinking breath; ſome of it is deſired to be ſent over with the fruit* Areica, *and the other Ingredients, and manner of preparing it.*

A. I have ſeen that *Betel* leaves in a ſhort time will ſpoil a *Durion*, take away his nature, and turn a fat creamy ſubſtance into water. Commonly thoſe that eat great quantities of Durions, eat a *Betel* afterwards as a *Correctorium*; but of laying a leaf upon the heart, I have never heard. As for the other qualities of the *Betel*, I believe they are good, if not abuſed; as moſt of the *Indians* do, who never are without it in their mouths, no not ſleeping, which corrodes their teeth, and makes them as black as Jet: It draws from the head the Flegmatick humours, which are voided by ſpitting; ſo we uſe it:

but

but the *Indians* ſwallow down their ſpittle, together with the juyce of the *Betel*, and the *Areica*. The manner of preparing it is eaſie, being nothing but the *Nut leaf* and *Calx viva*, of which laſt each one adds as much as pleaſeth his palat. There is a ſort of Fruit called *Sivgboa*, which is uſed with the *Areica*, inſtead of *Betel*, and can be dried and tranſported as well as the *Areica*, and hath the ſame force, but a great deal more pleaſant to the palate.

Q. 12. *Whether the* Papayas, *that beareth fruit like a Melon, do not grow, much leſs bear fruit, unleſs male and female be together?*

A They grow, as I have ſeen two in the Engliſh-houſe at *Bantam*, and bear little fruit, which never comes to perfection; but if the male and female be together, the one bears great Fruit, the other nothing but Flowers.

Q. 13 *Whether the* Arbor Triſte *ſheds its Flowers at the riſing of the Sun, and ſhut them again at the ſetting of the Sun? And whether the diſtill'd water thereof (called* Aqua di Mogli *by the* Portugals*) may not be tranſported to* England? *And whether at the riſing of the Sun the leaves of the* Arbor Triſte *drop off as well as the flowers?*

A. There is two ſorts of the *Arbor Triſte*; one is called by the *Portugals Triſte de Die*, the other *Triſte de Nocte*; the one ſheds his Flowers at the Riſing, the other at the Setting of the Sun; but neither of them ſhed their leaves. There is no body here that underſtands the diſtilling of waters; ſome ſay this *Aqua di Mogli* is to be had at *Malaca*, for which I have writ, and ſhall ſend it if procurable.

Q. 14. *Whether the* Arbor de Rays, *or Tree of Root, propagate it ſelf in a whole Forreſt, by ſhooting up and*

letting fall roots from its branches into the ground, that ſpring up again, and ſo on?

A. This is true. And we have divers trees about *Batavia*, and the like adjacent Iſlands, above fifty foot in the diameter.

Q. 15. *What kind of fruit is that in* Jucca, *which grows immediately out of the Trees body; and is ſaid to breed the* Plague *if eaten immoderately?*

A. It is a fruit much like to *Durion*, which groweth in the ſame manner; hath a faint ſmell, and ſweet wateriſh taſte; for my part I do not affect them: The *Plague* is a Diſeaſe unknown amongſt the *Indians*; but this fruit, as moſt others do, immoderately eaten, cauſes a *Dirthea*, which eaſily degenerates to a *Tenaſmus*, by us called *Peirſing*, a dangerous Sickneſs, and worſe than the *Plague*.

Q. 16. *What Poyſon is it the King of* Macaſſar *in* Colebees *is ſaid to have particular to himſelf, which not only kills a man immediately, that hath received the ſlighteſt Wound by a Dart dipt therein, but alſo within half an hours time, make the fleſh, touched with it, ſo rotten, that it will fall like Snivel from the Bones, and whoſe poyſonous Steam will ſoon fly up to a Wound made with an unpoyſoned Dart, if the Blood be only in the ſlighteſt manner touch'd with a Dart infected with the Poyſon? What certainty there is of this Relation?*

A. That there is ſuch a Poyſon in this Kings poſſeſſion is moſt certain; but what it is, no *Chriſtian* hitherto ever knew right. By the Government of *Arnold De Flamminge Van Outſhorn* divers have been tortured; yea, killed.

Some ſay it is the Gall of a Venemous Fiſh, Others ſay it is a Tree which is ſo Venemous, that thoſe who are condemned to die, fetch the Poyſon, but not one of

of an hundred ſcape death: the Roots of this Tree are held an Antidote againſt the Poyſon; but our People, when we had War with *Macaſſar*, found no Antidote like to their own or others Excrements; as ſoon as they felt themſelves wounded, inſtantly took a doſe of this ſame, which preſently provoked to vomit, and ſo, by repulſion, (as I perceive) and ſweat, freed the Noble parts from further Infection. That a Wound ſhould be infected by this Poyſon, though inflicted by an impoyſoned Weapon, is not ſtrange to thoſe who ſtudy Sympathy; And ſet belief in that much renowned Sympathetical Powder of Sir *Kenelme Digby*. Yet ſuch Effects of the *Macaſſars* Arts are unknown to us.

Q. 17. *Whether in* Pegu *and other places in the* Eaſt-Indies, *they uſe a Poyſon that kills by ſmelling, and yet the Poyſon ſmell is hardly perceived?*

To this no Anſwer was return'd.

Q. 18. *Whether* Camphire *comes from Trees? What kind of Trees they are in* Borneo, *that are ſaid to yield much excellent* Camphire, *as that one pound thereof is ſaid to be worth an hundred of that of* China *and other places?*

A. Camphire comes from Trees of an Exceſſive bulk, as you may ſee by the Cheſts which comes from *Jappan* into *Europe*, made of the ſame wood of *Borneo*; it comes likewiſe from Trees, which are ſaid to ſtand in Sandy Ground. And drop like a Gum.

But of late an Experiment is found in *Ceylon*, that the Root of a Cinnamon Tree yields as good *Camphire*, as either *Jappan*, or *China*, of which I ſhall ſend you a pattern, being now to be had at preſent here; as alſo an Oyl extracted from the ſame Roots, which

reſerves

reſerves ſomething of the Cinnamon ſmell: but may be the fault of the Diſtiller.

Q. 19. *Whether ſome of that rare Wood, called* Palo d' Aquila *and* Calamba, *of an Extraordinary value, even in the Country where it groweth, as in* Siam *about* San, *and* Patan, *and in* Cochinchina, *may not be brought over; as alſo ſome of thoſe ſtrange Neſts of* Cochinchina, *made by Birds upon Rocks, of a certain viſcous froth of the Sea, which Neſts grown dry and hard, are ſaid to become tranſparent; and when diſſolved in Water; ſerves excellently to ſeaſon all their Meats?*

A. If the Queſtion be made, whether theſe things may be brought over by permiſſion of the Company? I anſwer: as firſt, that their Laws forbid the tranſportation of all whatſoever, whether neceſſary to the conſervation of Health, or acquiſition of Wealth, or Rarities, *&c.* but if the *Querie* be concerning the nature and ſubſtance of the Wood and Neſts: they are tranſportable, and can ſubſiſt without decaying many years. *Lignum Aquilæ* is far inferiour to *Calamba*, though not eaſie to be diſcerned: the pound of *Calamba* is worth in *Jappan* thirty, and ſometimes forty pounds Sterling; the beſt comes from *Cambodia*, and ſeems to be the pith of the Tree *Aquilæ* in *Jappan*, it is uſed as Incence to perfume Cloth, and Chambers. It is held for a great Cordial, and commonly uſed by that Nation, as alſo the *Chineſes*: *In Defectione ſpirituum vitalium*; as in *Paraliſi & Nervorum laxatione & impotentia*: They rub it with *Aqua Cynamoni* upon a Stone, till the ſubſtance of the Wood is mixt, *ſicut pulpa*, with the Water, and ſo drink it with Wine, or what they pleaſe: The Birds-neſts are a great Reſtorative to Nature, and much uſed by the lecherous *Chinaes*.

Q. 20.

Q. 20. *Whether the Animal call'd* Abados, *or* Rhinoceros, *hath teeth, claws, fleſh, blood, and skin, yea his very dung and water, as well as his horns, Antidotal? And whether the horns of thoſe beaſts be better or worſe, according to the food they live upon.*

A. Their horns, teeth, claws, and blood are eſteemed Antidotes, and have the ſame uſe in the *Indian Pharmacopeia* as the *Therieca* hath in ours: the fleſh I have eaten is very ſweet and ſhort: ſome dayes before the Receipt of your Letter, I had a young one no bigger than a Spaniel Dog, which followed me whereever I went, drinking nothing but *Buffulo* milk, lived about three weeks, then his teeth began to grow, and got a looſeneſs, and died. 'Tis obſerved, that Children (eſpecially of *European* Parents) at the breaking out of their teeth are dangerous ſick, and commonly die of the ſcouring in theſe parts. His ſkin I have cauſed to be dryed, and ſo preſent it unto you, ſince fate permits not to ſend him you living; ſuch a young one was never ſeen before: The food I believe is all one to this Animal, being that they are ſeldome ſeen but amongſt withered Branches, Thiſtles and Thorns; ſo that the horn is of equal vertue.

Q. 21. *Whether the falſifying of the* China *Muſk is not rather done by mixing Oxen and Cows Livers dried and pulverized with ſome of the putrified and concrete fleſh and blood of the* China *Muſk-cat, than by beating together the bare fleſh and blood of this Animal,* &c.

Not anſwered.

Q. 22. *Whether there be two ſorts of* Gumlack, *one produced from a certain winged* Ant, *the other the* Exudation *of a Tree: The firſt had in the Iſlands of*

of Suachan, *the laſt in the Kingdome of* Martaban?

A. We know of none but ſuch as drop from Trees, and comes from divers places in *Siam*, *Cambodia*, *Pegu*, *&c.*

Q. 23. *If the beſt* Ambergreece *be found in the Iſlands* Socotora *and* Aniana, *neer* Java? *To endeavour the getting of more certain knowledge; what it is, being reported to be bred in the bottom of the Sea like to a thick mud?*

A. The beſt that is in the World comes from the Iſland *Mauritius*; And is commonly found after a Storm. The Hogs can ſmell it at a great diſtance; who run like mad to it, and devour it commonly before the people come to it. It is held to be a *Zeequal* viſcoſity, which being dried by the Sun, turns to ſuch a Conſiſtence as is dayly ſeen. *Myavines* father *Iſaac Vigny* a Frenchman in *Oleron*, hath been a great Traveller in his time, and he told me, he ſailed once in his youth through ſo many of theſe *Zeequalen*, as would have loaded ten thouſand Ships; the like having been never ſeen; his Curioſity did drive him to take up ſome of thoſe, which being dried in the Sun, were perceived to be the beſt *Ambergreece* in the World; I have ſeen one piece which he kept for a *Memento*, and another piece he ſold for 1300 *l.* Sterling. This being diſcovered, they ſet ſail to the ſame place where theſe *Zeequelen* appeared, and cruſing there, to and fro, for the ſpace of ſix weeks, but could not perceive any more. Where this place is ſcituated, I do not know; but Monſieur *Gentillot*, a French Captain in *Holland*, can tell you.

Q. 24. *To enquire of the* Divers *for Pearls ſtaying long under water; whether they do it by the aſſiſtance of any*

any thing they carry with them, or by long and often uſe get a trick of holding their breath ſo long, at the Iſle of Baharen *neer* Ormus?

A. What they do at *Baharen* is unknown to me, but ſince we have had *Tute Corein* in *Ceylon*, where very good Pearls grow, I hear the *Divers* uſe no Artifice. The manner is thus; at a ſet time of the year Merchants come from all parts, as likewiſe *Divers* with their Boats; each Boat hath a certain quantity of ſquare Stones, upon which Stones the *Divers* goe down, and give a token to their Companions, when they think it time to be hal'd up: each Stone payes tribute to the Company. The Oyſter or Shell-fiſh is not immediately open'd, but laid on heaps, or in holes at the Sea-ſide. When the Diving time is ended, the Merchants come, and buy theſe heaps, according as they can agree, not knowing whether they ſhall get any thing or no. So that this is a meer Lottery. This Pearl-fiſhing is dangerous, being the *Divers* commonly make their Will, and take leave of their Friends, before they tread the Stone to go down.

Q. 25. *Whether Cinnamon when firſt gathered hath no taſt at all, but acquires its taſte and ſtrength by fifteen dayes ſunning? And whether the Bark be gathered every two years in the Iſle of* Ceylon?

A. The Cinnamon Tree as it groweth, is ſo fragrant, that it may be ſmelt a great way off before it be ſeen. And hath even then, a moſt Excellent taſte; ſo that by Sunning it looſeth rather than acquires any taſte or force; the Tree being pill'd is cut down to the root; but the young Sprigs after a year or two give the beſt and fineſt Cinnamon.

Q. 26. *To learn, if it may be, what Art the Maſter-workmen of* Pegu, *have to add to the colour of their Rubies?*

A. Not anſwered.

Q. 27. *To inquire after, and get, if poſſible, ſome of the Bones of the Fiſh called* Caballa, *which are ſo powerful in ſtopping blood.*

A. 'Tis done, and they ſhall follow with the Dutch Ships.

Q. 28. *Whether at* Hermita, *a Town in* Ethiopia, *there are Tortoiſes, ſo big, that Men may ride upon them?*

A. It is reported, that there be extraordinary great ones there; I have ſeen ſome Sea-Tortoiſes here, of four foot broad, in oval form, very low leg'd, but of that ſtrength, that a man may ſtand on one: The manner of catching them, is to turn them with a Fork upon their backs.

Q. 29. *Whether there be a Tree in* Mexico, *that yields Water, Wine, Vinegar, Oyl, Milk, Honey, Wax, Thread and Needles?*

A. The *Cokos* Trees yields all this and more; the Nut, while it is green, hath very good Water in it, the Flower being cut, drops out great quantity of liquor, called *Sury*, or *Taywack*, which drank freſh, hath the force, and almoſt the taſte of Wine; grown ſowr, is very good Vinegar; and diſtilled, makes very good Brandy, or *Areck*: The Nut grated, and mingled with water, taſteth like Milk: preſſed, yields very good Oyl; Bees ſwarm in theſe Trees, as well as in others; Thread & Needles are made of the leaves and tough twigs. Nay, to add ſomething to this deſcription; in *Amboina*, they make Bread of the body of the Tree, the leaves ſerve to thatch houſes, and likewiſe ſails for their Boats.

Q. 30. *Whether about* Java, *there be Oyſters of that vaſt bigneſs, as to weigh three hundred weight?*

A. I

A. I have ſeen a Shell-fiſh, but nothing like an Oyſter, of ſuch a bigneſs, the Fiſh being ſalted, and kept in pickle, afterwards boyled, taſteth like Brawn in *England*, and is of an horney ſubſtance.

Q. 31. *Whether neer Malacca, there be found in the Gall of certain Swine, a Stone eſteemed incomparably above* Bezoar?

A. In that Country, but very ſeldome, there grows a Stone, in the Stomack of a *Porkapine*, called *Petro Porco*: of whoſe virtue there are large deſcriptions: and the *Hollanders* are now ſo fond, that I have ſeen 450. Dollars of ℔ given for one no bigger than a Pidgeons Egg; There is ſophiſtication as well in that as *Bezoar*, *Musk*, *&c.* and every day new falſhood, ſo that I cannot well ſet down here any rules, but muſt be judged by experience. A falſe one I ſend you, which doth imitate very near in virtue, the true one, but is a great deal bigger, and of another colour.

As for the Obſervations deſired of the Iſlands Saint *Helena*, and *Aſcenſion*, they may be better made by the Engliſh *Eaſt-India* men, which commonly touch at both places; but the *Hollander* never, or very ſeldome.

Q. 32. *Whether it be winter at the Eaſt ſide of the Mountain* Gates, *which comes from the North to Cape* Comoryn, *whilſt it is ſummer on the Weſt-ſide? and* Vice verſa.

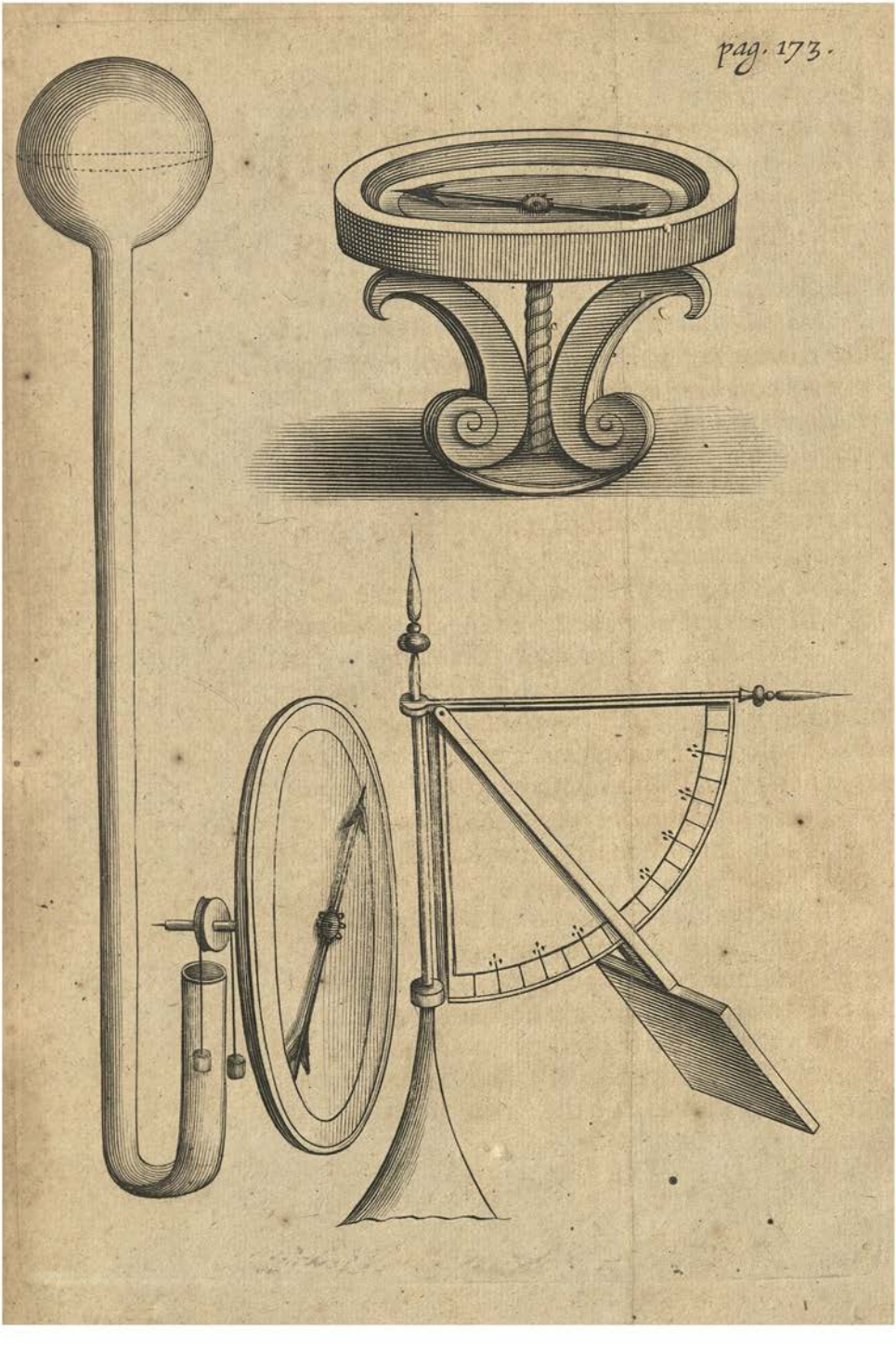
A. Not only there, but likewiſe on the Iſland of *Zeylon*.

Q. 33. *In what Country* Lignum Alloes *is found, whether it be the Wood of a Tree? or the Root of a Tree? How to know the beſt of the Kind?*

A. Lignum Alloes, *Lignum Paradiſi*, *Calamba*, are *Synonyma*, the ſame: And the ſame Wood comes moſt

from *Cambodia*, and *Siam*; but they ſay it is brought by the people of *Lawlan*, a Country about *Cambodia*, whence *Muſk*, and *Benzoin*, and moſt *Aromada* come: it is eaſily diſtinguiſhed from other Wood, by its ſtrong ſcent and richneſs of Balm in it, which appears in its blackneſs: it is of great Value, and hard to be gotten here.

The reſt of the *Queries* are not anſwered, becauſe the time is ſhort ſince I received them, and eſpecially, becauſe I cannot meet with any one that can ſatisfie me, and being unſatisfied my ſelf, I cannot nor will obtrude any thing upon you, which may hereafter prove fabulous; but ſhall ſtill ſerve you with truth.



A

METHOD

For making a Hiſtory of the Weather. By Mr. *HOOK*.

"FOr the better making a Hiſtory of the Weather, I conceive it requiſite to obſerve,

"1. The Strength and Quarter of the Winds, "and to regiſter the Changes as often as they hap-"pen; both which may be very conveniently "ſhewn, by a ſmall addition to an ordinary Wea-"ther-clock.

"2. The Degrees of Heat and Cold in the Air; "which will be beſt obſerved by a ſealed *Thermo-"meter*, graduated according to the Degrees of "*Expanſion*, which bear a known proportion to the "whole bulk of Liquor, the beginning of which gra-"dation, ſhould be that dimenſion which the Liquor "hath, when encompaſſed with Water, juſt begin-"ning to freeze, and the degrees of *Expanſion*, either "greater or leſs, ſhould be ſet or marked above it or "below it.

"3. The Degrees of Dryneſs and Moiſture in the "Air; which may be moſt conveniently obſerved by "a *Hygroſcope*, made with the ſingle beard of a wild "Oat perfectly ripe, ſet upright and headed with an "*Index*, after the way deſcribed by *Emanuel Magnan*; "the converſions and degrees of which, may be mea-"ſured by diviſions made on the rim of a Circle, in-

"the

"the *Center* of which, the *Index* is turned round: "The beginning or Standard of which Degree of "*Rotation*, ſhould be that, to which the *Index* points, "when the beard, being throughly wet, or covered "with Water, is quite unwreathed, and becomes "ſtraight. But becauſe of the ſmalneſs of this part of "the Oat, the cod of a wild *Vetch* may be uſed inſtead "of it, which will be a much larger *Index*, and will be "altogether as ſenſible of the changes of the Air.

"4. The degrees of Preſſure in the Air: which "may be ſeveral wayes obſerved, but beſt of all "with an Inſtrument with Quickſilver, contrived "ſo, as either by means of water or an *Index*, it may "ſenſibly exhibit the minute variations of that Acti-"on.

"5. The conſtitution and face of the Sky or Hea-"vens; and this is beſt done by the eye; here ſhould "be obſerved, whether the Sky be clear or clouded; "and if clouded, after what manner; whether with "high Exhalations or great white Clouds, or dark "thick ones. Whether thoſe Clouds afford Fogs or "Miſts, or Sleet, or Rain, or Snow, *&c.* Whether the "under ſide of thoſe Clouds be flat or waved and ir-"regular, as I have often ſeen before thunder. Which "way they drive, whether all one way, or ſome one "way, ſome another; and whether any of theſe be "the ſame with the Wind that blows below; the "Colour and face of the Sky at the riſing and ſetting "of the Sun and Moon; what Haloes or Rings may "happen to encompaſs thoſe Luminaries, their big-"neſs form and number.

"6. What Effects are produc'd upon other bo-"dies: As what Aches and Diſtempers in the bodies "of men: what Diſeaſes are moſt rife, as Colds, Fe-

"vours,

"vours, Agues, &c. What putrefactions or other "changes are produc'd in other bodies; As the ſweat- "ing of Marble, the burning blew of a Candle, the "blaſting of Trees and Corn; the unuſual ſprouting, "growth, or decay of any Plants or Vegetables: the "putrefaction of bodies not uſual; the plenty or "ſcarcity of Inſects; of ſeveral Fruits, Grains, Flow- "ers, Roots, Cattel, Fiſhes, Birds, any thing notable of "that kind. What conveniences or inconveniences "may happen in the year, in any kind; as by flouds, "droughts, violent ſhowers, &c. What nights produce "dews and hoar-froſts, and what not?

"7. What Thunders and Lightnings happen, and "what Effects they produce; as ſouring Beer or Ale, "turning Milk, killing Silk-worms, &c?

"8. Any thing extraordinary in the Tides; as "double Tides, later or earlier, greater or leſs Tides "than ordinary. Riſing or drying of Springs; Co- "mets or unuſual Apparitions, new Stars, *Ignes fatui* "or ſhining Exhalations, or the like.

"Theſe ſhould all or moſt of them be diligently "obſerved and regiſtred by ſome one, that is alwayes "converſant in or neer the ſame place.

"Now that theſe and ſome other, hereafter to be "mentioned, may be regiſtred ſo as to be moſt con- "venient for the making of compariſons, requiſite "for the raiſing *Axioms*, whereby the Cauſe or Laws "of Weather may be found out; It will be deſirable "to order them ſo, that the Scheme of a whole "Moneth, may at one view be preſented to the Eye: "And this may conveniently be done on the pages of "a Book in folio, allowing fifteen dayes for one ſide, "and fifteen for the other. Let each of thoſe pages "be divided into nine Columes, and diſtinguiſhed by

"per-

" perpendicular lines; let each of the firſt ſix Co-
" lumes be half an inch wide, and the three laſt equal-
" ly ſhare the remaining of the ſide.

" Let each Colume have the title of what it is to
" contain, in the firſt at leaſt, written at the top of it:
" As, let the firſt Colume towards the left hand, con-
" tain the dayes of the Moneth, or place of the Sun,
" and the remarkable hours of each day. The ſecond,
" the Place, Latitude, Diſtance, Ages and Phaces of
" the Moon. The third the Quarters and ſtrength of
" Winds. The fourth the Heat and Cold of the ſea-
" ſon. The fifth the Dryneſs and Moiſture of it. The
" ſixth the Degrees of preſſure. The ſeventh the fa-
" ces and appearances of the Sky. The eighth the
" Effects of the Weather upon other bodies, Thun-
" ders, Lightnings, or any thing extraordinary. The
" ninth general Deductions, Corollaries or Syllo-
" giſms, ariſing from the comparing the ſeveral *Phæ-*
" *nomena* together.

" That the Columes may be large enough to con-
" tain what they are deſigned for, it will be neceſſary,
" that the particulars be expreſſed with ſome Cha-
" racters, as brief and compendious as is poſſible.
" The two firſt by the Figures and Characters of the
" Signs, commonly us'd in Almanacks. The Winds may
" be expreſt by the Letters, by which they are ex-
" preſt in ſmall Sea-Cards: and the degrees of ſtrength
" by 1, 2, 3, 4, *&c.* according as they are marked in
" the contrivance of the Weather-cock. The degrees
" of Heat and Cold may be expreſt by the Numbers
" appropriate to the Diviſions of the *Thermometer.*
" The Dryneſs and Moiſture, by the Diviſions in the
" rim of the *Hydroſcope.* The preſſure by Figures
" denoting the height of the *Mercurial Cylinder.* But

for

"for the faces of the Sky, they are ſo many, that ma-
"ny of them want proper names; and therefore it
"will be convenient to agree upon ſome determi-
"nate ones, by which the moſt uſual may be in brief
"expreſt. As let *Cleer* ſignifie a very cleer Sky with-
"out any Clouds or Exhalations: *Checker'd* a cleer
"Sky, with many great white round Clouds, ſuch as
"are very uſual in Summer. *Hazy*, a Sky that looks
"whitiſh, by reaſon of the thickneſs of the higher
"parts of the Air, by ſome Exhalation not formed in-
"to Clouds. *Thick*, a Sky more whitened by a grea-
"ter company of Vapours: theſe do uſually make
"the *Luminaries* look bearded or hairy, and are of-
"tentimes the cauſe of the appearance of Rings and
"Haloes about the *Sun* as well as the *Moon*. *Overcaſt*,
"when the Vapours ſo whiten and thicken the Air,
"that the *Sun* cannot break through; and of this
"there are very many degrees, which may be expreſt
"by *a little, much, more, very much overcaſt*, &c. Let
"*Hairy* ſignifie a Sky that hath many ſmall, thin and
"high Exhalations, which reſemble locks of hair, or
"flakes of Hemp or Flax: whoſe varieties may be
"expreſt by *ſtraight* or *curv'd*, &c. according to the
"reſemblance they bear. Let *Water'd* ſignifie a Sky
"that has many high thin and ſmall Clouds, looking
"almoſt like water'd Tabby, called in ſome places a
"Mackeril Sky. Let a Sky be called *Waved*, when
"thoſe Clouds appear much bigger and lower, but
"much after the ſame manner. *Cloudy*, when the Sky
"has many thick dark Clouds. *Lowring*, when the
"Sky is not very much overcaſt, but hath alſo under-
"neath many thick dark Clouds which threaten
"rain. The ſignification of *gloomy, foggy, miſty, ſleet-
"ing, driving, rainy, ſnowy*, reaches or racks *va-*

"*riable, &c.* are well known, they being very com-
"monly uſed. There may be alſo ſeveral faces of
"the Sky compounded of two or more of theſe,
"which may be intelligibly enough expreſt by two
"or more of theſe names. It is likewiſe deſirable, that
"the particulars of the eighth and ninth Columes
"may be entered in as little room, and as few words
"as are ſufficient to ſignifie them intelligibly and
"plainly.

"It were to be wiſht that there were divers in ſe-
"veral parts of the World, but eſpecially in diſtant
"parts of this Kingdom, that would undertake this
"work, and that ſuch would agree upon a common
"way ſomewhat after this manner, that as neer as
"could be, the ſame method and words might be
"made uſe of. The benefit of which way is eaſily e-
"nough conceivable.

"As for the Method of uſing and digeſting thoſe
"ſo collected Obſervations; That will be more ad-
"vantageouſly conſidered when the *Supellex* is pro-
"vided; A Workman being then beſt able to fit
"and prepare his Tools, for his work, when he ſees
"what materials he has to work upon.

A SCHEME

At one View repreſenting to the Eye the Obſervations of the Weather for a Month.

Dayes of the Month and place of the Sun. Remarkable houſe.	Age and ſign of the Moon at Noon.	The Quarters of the Wind and its ſtrength.	The Degrees of Heat and Cold.	The Degrees of Dryneſs and Moyſture.	The Degrees of Preſſure.	The Faces or viſible appearances of the Sky.	The Notableſt Effects.	General Deductions to be made after the ſide is fitted with Obſervations: As,
4 8	27	W. 2. 3	9 12	2 2	5 8	29	Clear blew, but yellowiſh in the N. E.	A great dew.	From the laſt quarter of the Moon to the change the weather was very temperate but cold for the ſeaſon; the Wind pretty conſtant between N. and W.
14 12 ☌ 9. 46.		3½	16				Clowded toward the S.	Thunder, far to the South.	
☌ 4				2	9	29	Checker'd	A very great	
12.46 8	Perigeũ.		10				blew.	Tide.	
12		W.SW. 1	7	2		29			
8		N.W. 3	9	2 8½		29	A clear Sky all day, but a little checker'd at 4. P.M. at Sunſet red and hazy.	Not by much ſo big a Tide as yeſterday. Thunder in the North.	
15 4	28	4		2 9					
☌ 6	☌ 24. 51.	N. 2	8						
13. 40 10		1	7	2 10		29			
10	N. Moon, at 7. 25' A.M. ☌ 10. 8.	S. 1	10	1 10		28	Overcaſt and very lowring.	No dew upon the ground, but very much upon Marble ſtones, &c.	A little before the laſt great Wind, and till the Wind roſe at its higheſt, the Quickſilver continued deſcending till it came very low; after which it began to reaſcend,
16 ☌ 14. 37	&c.	&c.	&c.	&c.	&c.	&c.			&c.

DIRECTION

For the Obſervations of the Eclipſes of the MOON.

By Mr. *ROOKE.*

"ECliſes of the Moon are obſerved for two prin-
"cipal Ends; One *Aſtronomical*, that by compa-
"ring Obſervations with Calculations, the *Theory* of
"the *Moons* motion may be perfected, and the Ta-
"bles thereof reformed: The other *Geographical*,
"that by comparing among themſelves Obſervations
"of the ſame *Ecliptical Phaſes*, made in divers places,
"the difference of *Meridians*, or *Longitudes* of thoſe
"places may be diſcovered.

"The Knowledge of the *Eclipſes* Quantity and
"Duration, the Shadows, Curvity and Inclination,
"*&c.* conduce only to the former of theſe Ends:
"The exact time of the beginning, middle, and end
"of the *Eclipſes*, as alſo in total ones, the beginning
"and end of total darkneſs is uſeful for both of
"them.

"But becauſe theſe times conſiderably differ in
"Obſervations made by the bare eye, from thoſe with
"a *Teleſcope*, and becauſe the beginning of *Eclipſes*
"and the end of Total darkneſs are ſcarce to be ob-
"ſerved exactly, even with Glaſſes (one not being a-
"ble clearly to diſtinguiſh between the true ſhadow
"and *Penumbra*, unleſs one have ſeen, for ſome time
"before, the line, ſeparating them, paſs along upon the
"ſurface

"ſurface of the *Moon*). And laſtly, becauſe in ſmall "partial *Eclipſes*, the beginning and end (and in to-"tal ones of ſhort continuance in the ſhadow, the be-"ginning and end of total darkneſs) are unfit for "nice Obſervations, by reaſon of the ſlow change of "apparences, which the oblique motion of the ſha-"dow then cauſeth: For theſe Reaſons I ſhall pro-"pound a Method particularly deſigned for the ac-"compliſhment of the *Geographical* end in obſerving "*Lunar Eclipſes* free (as far as is poſſible) from all the "mentioned inconveniences: For,

"Firſt, It ſhall not be practicable without a *Tele-"ſcope.*

"Secondly, The Obſerver ſhall alwayes have Op-"portunity before his principal Obſervation, to note "the diſtinction between the true ſhadow and *Pen-"umbra.*

"Thirdly, It ſhall be applicable to thoſe ſeaſons "of the *Eclipſe*, when there is the ſuddeneſt altera-"tion in the apparences. To ſatisfie all which in-"tents,

"Let there be of the eminenteſt Spots, diſperſed "over all Quarters of the *Moons* ſurface, a ſelect "number generally agreed on, to be conſtantly made "uſe of to this purpoſe, in all parts of the world: As "for Example, thoſe which *Hevelius* calleth.

"*Mons* { *Sinai*, *Etna*, *Porphyrites*, *Serrorum* } *Inſula* { *Besbicus*, *Creta* } *Palus* { *Mæotis*, *Maræotis*, *Lacus Niger Major*.

"Let

"Let in each *Eclipſe* (not all, but for inſtance) three "of theſe Spots, which then lye neareſt to the *Eclip-* "*tic*, be exactly obſerved, when they are firſt touched "by the true ſhadow, and again when they are juſt "compleatly entered into it; and (if you pleaſe) "alſo in the decreaſe of the *Eclipſe*, when they are firſt "fully clear from the true ſhadow: For the accu- "rate determination of which moments of time (that "being in this buſineſs of main importance) let there "be taken *Altitudes* of remarkable fixed Stars, on "this ſide the line, of ſuch as lye between the *Æqua-* "*tor* and *Tropic* of *Cancer*; but beyond the line, of "ſuch as are ſcituated towards the other *Tropic*; "and in all places, of ſuch, as at the time of Obſer- "vation, are about four hours diſtant from the *Me-* "*ridian*.

Mr.

Mr. ROOK'S

DISCOURSE

Concerning the Obſervations of the Eclipſes of the *Satellites* of *Jupiter*.

Longitudinis ſive Differentiæ Meridianorum ſcientia eſt vel Nautica, vel Geographica.

Illa Navis aquæ innatantis; Hæc Urbium, Inſularum, Promontoriorum, &c. Globo terreſtri adhærentium ſitum inveſtigat.

In Navi, motu vario ſubinde tranſlatâ; Obſervatio identidem eſt repetenda; at loci terreni, fixam perpetuò ſedem obtinentis, poſitionem ſemel determinaſſe ſufficit.

Maria, fluctibus ut plurimum agitata, ſubtilem Inſtrumentorum, præſertim Teleſcopii longioris tractationem minime permittunt.

Longitudinis Scientia Nautica vix unquam de Cælo expectanda: Geographica vero ab Eclipſibus Corporum cæleſtium præcipuè petenda.

Eclipſes ſunt vel { *Veteribus notæ, ſcil. Solis & Lunæ* / *Satellitum Jovis, ante Tubi Optici uſum incognitæ.*

(*Miſſam fecimus Cl. Hugenii Lunulam Saturniam, Obſervatu difficiliorem.*)

Illarum per multa retro ſæcula Obſervationes; nè duo quidem loca quantum Meridianorum intercapidinem habeant, ſatis certò definitum eſſe Experimur: harum verò per pauculos annos adhibendâ diligenti animadverſione;

verſione; præcipuæ totius terrarum Orbis partes, quomodo ad ſe invicem ſitæ ſint, accuratiùs determinatum iri non deſperamus.

Cauſæ, ob quas minùs in hac negotio præſtitêre Eclipſes Luminarium,

Sunt { 1. Communis, utriſque ipſarum Raritas
Propria { 2. Solari, Parallaxis Lunæ.
3. Lunari, Penumbra Terræ.

His ergo præferimus Satellitum Jovialium defectus frequentiſſimos, ſine ulla Parallaxi, in quibus etiam penumbra Jovis prodeſſe magis, quam officere videtur.

Methodus Longitudinis, ex Eclipſibus vel aliis Phænomenis Cœleſtibus, indagandæ duplex eſt: Una, cum tempore ad Meridianum Tabularum proprium ſupputato, tempus alibi obſervatum; Altera, tempora variis in locis obſervata, inter ſe comparat.

Cum Arti Nauticæ Prior illa unicè interſerviat quæ motus cœleſtes accuratiùs multò, quam nobis ſperandum videtur, cognitos ſupponit; ob Aſtronomiæ imperfectionem, & obſervationum Marinarum hallucinationem perpetuo ferè neceſſarium: ſupra pronunciavimus Longitudinis Scientiam Nauticam vix unquam de Cœlo expectandam.

Methodus altera, Geographiæ perficiendæ idonea, cum non aliam ob cauſam prævium Calculum adhibeat, niſi ut eo moniti plures, eidem Phænomeno, in diſſitis locis, obſervando ſimul invigilent; Periodorum atque Epocharum ακρίβειαν minimè deſiderat.

Satellites Jovis numero ſunt quatuor, varia apud Authores nomina ſortiti; nos ex diverſis, quæ a Jove obtinent intervallis, 1. Intimum, 2. Penintimum, 3. Penextimum, 4. Extimum appellabimus.

Horum

Horum non niſi uniuſmodi φαινόμενον Obſervandum proponimus; immerſionem nempè in Umbram Jovis ſive ipſum Eclipſeces initium.

Solam hanc φάσιν ſeligimus, utpote in indiviſibili ferè conſtitutam: Licet enim luminis languor atque diminutio moram aliquantulam trahere poſſit, omninodo tamen Extinctio & Evaneſcentia (de qua unicè ſoliciti ſumus) momento quaſi contingere deprehendetur.

Ante 8 ☉ ♃ Satellites ad Occidentem Diſci Jovialis reſpectu, in deliquia incidunt; poſt Acronychia, ad Orientem.

Intimi & (niſi fortè rariſſimè) penintimi Eclipſeων tantum Occidentalium initia nobis apparere poſſunt: duòrum autem remotiorum multa etiam Orientalium exordia conſpicere licet.

Defectus Medicæorum obſervatu faciliores reddant. 1. Major Planetarum claritas. 2. Motus ipſorum tardior. 3. Penumbra Jovis craſſior. 4. Longius a Joviali Diſco intervallum: at Obſervationum ἀκριβέια condicit. 1. Motus Satellitum velocior. 2. Penumbra Jovis anguſtior.

Hæc omnia nobiſcum meditati, ſubductâ benè ſingulorum ratione, Satellitum intimum & penextimum ad rem noſtram præ cæteris accommodatos; atque adeò, cum ſatis frequentes ſint ipſorum Eclipſes, ſolos adhibendos eſſe judicamus.

Extimum omninò negligimus utpotè minimum omnium & obſcuriſſimum; præſertim verò quod tantâ nonnunquam ſit Latitudine prædictus, ut Umbra Jovis ipſum Aphelium neutiquam attingat.

Penintimus autem nullâ gaudet ex ſuprà recenſitis Prærogativâ, quæ alterutri ſaltem eorum, quos jam prætulimus, potiori jure non debeatur.

Maxima, Satellitum in Umbra incidentium, a limbo

Diſci Jovialis diſtantia, unâ aut alterâ, poſt priorem Solis & Jovis quadraturam, hebdomada contingit.

Eſtque ea Penextimi ſeſquidiametro Jovis ferè æqualis: Intimi verò ſemidiametro ejuſdem non multò major ſextâ ante memoratam Quadraturam Hebdomada; Penextimus Umbram ingrediens, Diametro Jovis à diſco abeſt: Augendâ indè uſque ad maximam diſtantiâ incremento (non uniformi ſed) continuè decreſcente.

Hinc iiſdem reciprocè paſſibus (decremento ſc. ſenſim increſcente) diminuitur iſtiuſmodi intervallum, ad bimeſtre uſque tempus a dictâ Quadraturâ elapſum, quando iterum Diametro Joviali æquatur.

Poſteà autem uſque ad ipſa Acronychia, penextimus Umbram ſubiturus, æquabili ferè gradu (ſingulis nempe hebdomadis quadrante Diametri) promotus ad limbum Jovis accedit. Intimi, pro diverſo Jovis ad ſolem ſitu, diſtantia eâdem planè ratione variatur: ejus enim, quam ubique obtinet, Penextimus, trienti fere perpetuo eſt æqualis.

Menſe circiter poſt Jovem ſoli oppoſitum, Penextimus (Intimi poſt 8 ☉ ♃, immerſiones obſervari non poſſe ſuprà innuimus) ſimul ac corporis Jovialis limbum orientalem tranſierit, Occidentalem umbra continuo intrabit.

Inde augetur paulatim penextimi evaneſcentis diſtantia, donec unâ aut alterâ ante poſteriorem quadraturam hebdomadâ, maxima evadat; quando a diſci Jovialis margine ſemidiametro ejuſdem removetur.

Poſtquam autem hucuſque diminutâ ſenſim velocitate, umbra Jovis ab ipſius Diſco receſſit: hinc, motu continue accelerato, ad eundem redit.

Per bimeſtre ante & poſt Jovis cum ſole conjunctionem ſpatium in locis Longitudine multum differentibus, eadem Eclipſis apparere nequit: adeoque tunc

temporis

temporis observationes instituere non est operæ pretium.

Quæ cum ita sint, tempus quadrimestre, a sextili priori usque ad ipsa ferè Acronychia numerandum, utrique Satelliti Observando erit unice opportunum: Penextimi autem soli, insuper trimestre, ab altero post oppositionem mense ad sextilem posteriorem.

Intra tempora jam definita, octoginta circiter utriusque simul Satellitis fient Eclipses; Penextimi sc. fere triginta, intimi autem quinquaginta.

Has cum (non ubivis terrarum sed) aliæ aliis in locis sint conspiciendæ, in sex Classes digeremus.

1. *In Europâ & Africâ*
2. *In Asiâ.*
3. *In Americâ.*
4. *In Europa Africa & Asia.*
5. *In Europa, Africa & America.*
6. *In Asia Orient. & America Occident.*

} *Eclipses observandas comprehendet.*

Non opus est fortè, ut moneamus in Insulis

Oceani { *Æthiopici* / *Atlantici* / *Pacifici* } *observandam esse Classem* { 4^{am}. / 5^{am}. / 6^{am}. }

Calculus Eclipsium a nobis exhibendus in ipso fortasse loco ad quem instituitur, plus horâ integrâ nonnunquam à vero observabit, ob variam sc. in Satellitum motu ἀνωμαλίαν ab Excentricitate (ut verisimile est) & propriarum ipsis Orbitarum ad Jovis Orbitam inclinatione oriundam.

Alibi autem terrarum multo minus calculo fidendum, propter incertam insuper in plerisque locis Meridianorum

rum Differentiam; quæ tamen, ut fiat, Reductio temporis, aliqua utcunque adhibenda eſt.

Longam itaque futuram ſepiuſculè Eclipſium harum expectationem præmonemus, aſſiduamque interim attentionem, nec (ob καιρὸν admodum ὀξὺν) unquam fere interruptam, eſſe continuandum: primam enim, quam viſu aſſequi poſſumus, luminis diminutionem, breviſſimâ (præſertim in intimo) interpoſitâ morulâ mox inſequitur perfecta ejus extinctio.

Moleſtum autem in obſervando tædium, ſummæ Τηρήσεων ἀκριβείας *abunde compenſabit, idemque plurimum minuit ſociorum mutuas operas tradentium, ubi ſuppetit præſentia.*

Ad momenta temporis accuratiſſime notanda (quod in hujuſmodi Obſervationibus eſt Palmarium) perutile erit Horologium Oſcillatorium, ab ingenioſiſſimo & candidiſſimo Hugenio feliciter excogitatum.

Appendix.

LOngitudinis Scientiam Nauticam vix unquam de Cœlo expectandam ſuprà aſſeruimus: ſigna tamen ejuſmodi aliquando futura eſt, non aliud Fundamentum, quam Lunarium motuum præciſam cognitionem, habitura videtur. Horum autem reſtitutionem a Parallaxi inchoandam ſolertiſſime monuit Keplerus. Parallaxeos verò indagandæ, & a Lunæ latitudine (cui ſemper ferè complicatur) diſtinguendæ optima (ſi non ſola) Methodus eſt, quæ, in regionibus longe diſſitis & ſub eodem Meridiano poſitis, altitudinum Lunæ Meridianarum, per ſingulas orbitæ partes, ſimul obſervatarum ſeries innititur: inde enim, Polorum elevatione ſolum præcognitâ, certiſſima innoteſcit Globi Lunaris à Terreſtri diſtantia.

Pro-

Proponimus itaque nos Africæ Promontorium Cap. Bonæ Spei, vel in Oceano Atlantico Sanctæ Helenæ Inſulam, cum locis in Europâ iis reſpondentibus, Satellitum ope, docuimus, determinandis, in quibus iſtiuſmodi obſervationes commodiſſime inſtituantur.

Upon the Reading of theſe laſt *Directions*, Mr. *Rook* the Author of them being dead, I cannot forbear ſaying ſomething of that excellent Man, which his incomparable *Modeſty* would not have permitted me to write, if he had been living. He was indeed a man of a profound *judgment*, a vaſt *comprehenſion*, prodigious *memory*, ſolid *experience*. His *skill* in the *Mathematicks* was reverenc'd, by all the lovers of thoſe ſtudies: and his *perfection* in many other ſorts of Learning, deſerves no leſs admiration. But above all, his *Knowledge* had a right influence, on the temper of his mind, which had all the humility, goodneſs, calmneſs, ſtrength, and ſincerity of a ſound, and unaffected *Philoſopher*. This is ſpoken not of one, who liv'd long ago, in praiſing of whom, it were eaſie to *feign*, and to exceed the *Truth*, where no mans memory could confute me: But of one, who is lately dead, who has many of his acquaintance ſtill living, that are able to confirm this *teſtimony*; and to joyn with me, in delivering down his name to poſterity, with this juſt character of his *Virtues*. He dy'd in the year ſixty two, ſhortly after the eſtabliſhment of the *Royal Society*, whoſe *Inſtitution* he had zealouſly promoted. And it was a deplorable accident in his Death, that he deceas'd the *very night*, which he had for ſome years expected, wherein to finiſh his accurate Obſervations on the *Satellites* of *Jupiter*: however this *Treaſure* will not be loſt, for the *Society* has

referr'd

referr'd it to ſome of the beſt *Aſtronomers* of *Europe*, to bring his beginnings to concluſion.

Sect. XXXI *Their Propoſals and Recommendations.*

To many of theſe *Queries* they have already receiv'd good *returns*, and *ſatisfaction:* and more ſuch *Accounts* are daily expected from all coaſts. Beſides theſe, there have been ſeveral great and profitable *Attempts*, relating to the good of mankind, or the *Engliſh Nation*, propounded to them, by many publick Bodies, and private perſons: which they have again recommended, to be examin'd apart, by divers of their own *number*, and by other men of *ability* and *integrity*, who have accepted of their *Recommendations* of this kind, the Principal, that I find recorded in their *Regiſters*, are theſe.

They have propounded the compoſing a *Catalogue* of all *Trades*, *Works*, and *Manufactures*, wherein men are emploi'd, in order to the collecting each of their Hiſtories: by taking notice of all the Phyſical Receipts, or Secrets, the Inſtruments, Tools, and Engines, the Manual operations or ſleights, the cheats, and ill practices, the goodneſs, baſeneſs, and different *value* of Materials, and whatever elſe belongs to the operations of all *Trades*.

They have recommended the making a *Catalogue*, of all the kinds of *natural things* to be found in *England*. This is already in a very good forwardneſs. And for its better completing, many *Expedients* for the preſerving, drying, and embalming of all living Creatures have been proſecuted.

They have ſuggeſted the making a perfect *Survey*, *Map*, and *Tables* of all the fix'd Stars within the *Zodiac*, both viſible to the naked eye, and diſcoverable by a ſix foot *Teleſcope*, with a large aperture; towards the

the obſerving the apparent places of the Planets, with a *Teleſcope* both by Sea and Land. This has been approv'd, and begun, ſeveral of the *Fellows* having their portions of the Heavens allotted to them.

They have recommended the advancing of the *Manufacture* of *Tapiſtry*: the improving of *Silk making*: the propagating of *Saffron*: the melting of *Lead-Oar* with Pit-coal: the making Iron with Sea-coal: the uſing of the Duſt of Black Lead inſtead of Oyl in Clocks: the making *Trials* on *Engliſh* Earths, to ſee if they will not yield ſo fine a ſubſtance as *China*, for the perfecting of the Potters Art.

They have *propounded*, and *undertaken* the comparing of ſeveral *Soyls*, and *Clays*, for the better making of *Bricks*, and *Tiles*: the way of turning *Water* into *Earth*: the obſerving of the growth of Pibbles in Waters: the making exact *Experiments* in the large *Florentine* Loadſtone: the conſideration of the *Bononian* Stone: the examining of the nature of *Petrifying Springs*: the uſing an *Umbrella Anchor*, to ſtay a Ship in a ſtorm: the way of finding the *Longitude* of places by the *Moon*: the obſervation of the Tides about *Lundy*, the Southweſt of *Ireland*, the *Bermoodas*, and divers parts of *Scotland*; and in other Seas and Rivers where the ebbing and flowing is found to be irregular.

They have ſtarted, and begun to practiſe the propagation of *Potatoes*; the planting of *Verjuyce Grapes* in *England*; the Chymical examination of *French*, and *Engliſh* Wines; the gradual obſervation of the growth of *Plants*, from the firſt ſpot of life; the increaſing of *Timber*, and the planting of Fruit Trees; which they have done by ſpreading the Plants into many parts of the Nation, and by publiſhing a large

large *Account* of the beſt wayes of their cultivation.

They have propounded, and attempted with great effect, the making *Experiments* with *Tobacco oyl*; the Anatomizing of all amphibious Creatures, and examining their Lungs; the obſerving the manner of the *Circulation* of the blood in Fiſhes; the wayes of tranſporting Fiſh from one place to another for Breed; the *collecting Obſervations* on the *Plague*; the examining of all the ſeveral wayes to breed *Bees*; the altering the taſte of the Fleſh of *Animals*, by altering their food; the probability of making *Wine* out of *Sugar-canes*: Which laſt I will ſet down as one Example.

A PROPOSAL For making WINE.

By Dr. GODDARD.

IT is recommended to the care of ſome skilful Planters in the Barbadoes, to try whether good Wine may not be made out of the Juyce of Sugar-canes. That which may induce them, to believe this work to be poſſible, is this Obſervation, that the Juyce of Wine, when it is dry'd, does alwayes granulate into Sugar, as appears in Raiſins, or dry'd Grapes: and alſo that in thoſe veſſels wherein cute, or unfermented Wine is put, the ſides are wont to be cover'd over with a cruſt of Sugar. Hence it may be gather'd, that there is ſo great a likeneſs of the liquor of the Cane, to that of the Vine, that it may probably be brought to ſerve for the ſame uſes. If this attempt ſhall ſucceed, the advantages of it will be very conſiderable. For the Engliſh being the chief Maſters of the Sugar Trade, and that falling very much in its price of late years, while all other outlandiſh productions are riſen in their value: it would be a great benefit to this Kingdom, as well as to our Weſtern Plantations, if part of our Sugar, which is now in a manner a meer Drug, might be turn'd into Wine, which is a Forein Commodity, and grows every day dearer: eſpecially ſeeing this might be done, by only bruiſing, and preſſing the Canes, which would be a far leſs labour and charge, than the way, by which Sugar is now made.

Theſe are ſome of the moſt advantageous *propoſals*, they have ſcatter'd, and incourag'd in all places, where their Intereſt prevails. In theſe they have recommended to many diſtinct, and ſeparate *Trials*, thoſe deſigns, which ſome private men had begun, but could not accompliſh, by reaſon of their *charge*: or thoſe which they themſelves have devis'd, and conceiv'd capable of ſucceſs: or even thoſe of which men have hitherto ſeem'd to deſpair. Of theſe, ſome are already brought to a hopeful iſſue: ſome are put in uſe, and thrive by the practice of the publick: and ſome are diſcover'd to be feaſible, which were only before thought imaginary, and fantaſtical. This is one of the greateſt *powers* of the true, and unwearied *Experimenter*, that he often reſcues things, from the jaws of thoſe dreadful Monſters, *Improbability*, and *Impoſſibility*. Theſe indeed are two frightful words to weaker minds, but by Diligent and Wiſemen, they are generally found to be only the excuſes of *Idleneſs*, and *Ignorance*. For the moſt part, they lie not in the things themſelves, but in mens falſe *opinions* concerning them they are rais'd by *opinions*, but are ſoon aboliſh'd by *works*. Many *things*, that were at firſt improbable to the minds of men, are not ſo to their eyes: many that ſeem'd unpracticable to their *thoughts*, are quite otherwiſe to their *hands*: many that are too difficult for their naked hands, may be ſoon perform'd by the ſame hands, if they are ſtrengthen'd by *Inſtruments*, and guided by *Method*: many that are unmanageable by a few hands, and a few Inſtruments, are eaſie to the joynt force of a multitude: many that fail in one *Age*, may ſucceed by the renew'd indeavors of *another*. It is not therefore the conceit or fancy of men alone, that is of ſufficient

cient authority to condemn the moſt unlikely things for *Impoſſible*: unleſs they have been often attempted in vain, by many *Eyes*, many *Hands*, many *Inſtruments*, and many *Ages*.

This is the *aſſiſtance*, and *information*, they have given to others, to provoke them to inquire, and to order, and regulate their *Inquiſitions*. To theſe I will add the *Relations* of the effects of *Nature*, and *Art*, which have been communicated to them. Theſe are infinite in number. And though many of them have not a ſufficient confirmation, to raiſe *Theories*, or *Hiſtories* on their *Infallibility*: yet they bring with them a good aſſurance of likelihood, by the integrity of the *Relators*; and withall they furniſh a judicious *Reader*, with admirable hints to direct his Obſervations. For I will once more affirm, that as the minds of men do often miſtake *falſhoods* for *Truths*, though they are never ſo circumſpect: ſo they are often drawn by uncertain, and ſometimes erroneous *reports*, to ſtumble on *truths*, and *realities*; of this vaſt heap of *Relations*, which is every where ſcatter'd in their *Entry Books*, I will only take notice of theſe occaſional *Accounts*. § XXXII. *The Relations of things of Nature and Art, they have receiv'd.*

Relations of two new kinds of *Stars*, obſerv'd in the year ſixty ſix, the one in *Andromeda*, the other in *Cygnus*, in the ſame place, where they appear'd ſixty years ſince, and have ever ſince diſappear'd: of ſeveral Obſervations of *Cœleſtial Bodies* made in *Spain*: of Obſervations of ſeveral of the *Planets* made at *Rome*, and in other parts, by extraordinary *Glaſſes*: of the comparative goodneſs of *Glaſſes* us'd in other Countries: of ſeveral *Eclipſes* obſerv'd in divers parts of the World.

Relations of *Parelii*, and other ſuch appearances

ſeen in *France*: of the effects of *Thunder* and *Lightning*: of *Hurricanes*, and *Spouts*: of the bigneſs, figure, and effects of *Hailſtones*: of *Fiſh*, and *Frogs* ſaid to be rain'd: of the raining of Duſt out of the *Air*, and of the diſtance it has been carri'd by great *Fires*, and *Earthquakes*: of changes of Weather, and a way of predicting them: of the vermination of the *Air*: of the ſuppos'd raining of *Wheat* in *Gloceſterſhire*, which being ſown was found to be nothing but *Ivy-Berries*.

Relations of a *Spring* in *Lancaſhire*, that will preſently catch fire on the approach of a Flame: of *Burning-glaſſes* performing extraordinary effects: of *Burning glaſſes* made with Ice: of *Fire-balls* for Fuel: of a more convenient way of uſing *Wax-candles*: of the kindling of certain Stones, by their being moiſten'd with Water: of uſing ordinary Fuel to the beſt advantage.

Relations of the times of the riſing, and diſappearing of *Springs*: of Artificial *Springs*: of the Natures of ſeveral of our *Engliſh Springs*, and of other *Oleaginous*, and *Bituminous Springs*: of the fitneſs, and unfitneſs of ſome waters for the making of *Beer*, or *Ale*: of brewing Beer with *Ginger* inſtead of *Hops*: of *Tides* and *Currents*: of *Petrifying Springs*: of the Water blaſts of *Tivoly*: of *Floating Iſlands* of *Ice*: of the ſhining of *Dew* in a Common of *Lancaſhire*, and elſewhere: of *Divers*, and *Diving*, their habit, their long holding their breath, and of other notable *things* obſerv'd by them.

Relations of the Effects of *Earthquakes*, and the moving, and ſinking of Earths: of deep *Mines*, and deep *Wells*: of the ſeveral layers of Earth in a Well at *Amſterdam*: of the ſhining Cliffs in *Scotland*: of the layers of Earth obſerv'd in divers Clifts: of *Screw-Stones*,

Stones, *Lignum Foſſile*, Blocks buried in *Exeter* River, Trees found under ground in *Cheſhire*, *Lincolnſhire*, and elſewhere: of a Coal-Mine wrought half a mile from the ſhore, under the Sea: of the fatal effects of *damps* on *Miners*, and the ways of recovering them.

Relations of the extraordinary ſtrength of ſome ſmall *Loadſtones*, taking up above 150. times their own weight: of ſeveral *Engliſh Loadſtones*: of the variation of the *Loadſtone* obſerv'd in two *Eaſt-India* voyages, and other places: of the growing of *Pebbles* inclos'd in a glaſs of water: of ſeveral excellent *Engliſh* clays: of Gold found in little lumps in a Mine in *England*: of the moving ſands in *Norfolk*.

Relations about refining *Lead*, and *Tin-Oar*: of hardning *Steel* ſo as to cut *Porphyry* with it, and ſoftning it ſo much, as to make it eaſie to be wrought on: of impregnating *Lead-Oar* with *Metal*, after it has been once freed: of *Petrify'd Teeth*, and a Petrifi'd humane *fœtus*: of ſeveral wayes of ſplitting Rocks: of living Muſcles found in the midſt of Rocks at *Legorn*: of the way of making *Quick-ſilver*: of things obſervable at the bottom of the Sea: of a ſoft Metal, which hardens after it has taken off the Impreſſion, and the way of reducing ſuch impreſſions into as ſmall a proportion as is deſir'd.

Relations about *Agriculture*: of ordering of *Vines*: of the ſetting and planting of Trees ſeveral wayes: of *Elms* growing from chips, of new Trees ſprung from rotten roots: of ſeveral kinds of Trees, growing one out of another; and in the place of others: of the beſt wayes of pruning: of making a kind of Silk with *Virginia* Graſs: of a kind of Graſs making ſtronger Ropes than the common Hemp: of a new way of ordering *Mulberry* Trees in *Virginia*:

Virginia: of a *Locuſt* Tree *Bow* ſtanding bent ſix months, without looſing its *Spring*: of a way of improving the planting of *Tobacco*.

Relations of the uſefulneſs of changing ſeed yearly: of the ſteeping, liming, ſowing it ſeveral wayes: of freeing it from Worms: preſerving it long (as *eighty years*) of freeing it from *ſmut*; of the cauſes, and firſt ſigns of *ſmut*: of the *Inſtrument* and way of chopping Straw, for the feeding of *Horſes*: of Plants growing in *meer Water*: of others growing in *meer Air*: of ſeveral *Indian* Woods: of the growing of the divided parts of *Beans*: of the growing of chopp'd ſtalks of *Potatoes*: of ordering *Melons*: of keeping their Seed, and producing extraordinary good ones without *tranſplanting*.

Relations of the growth, breeding, feeding, and ordering of *Oyſters*: of a *Sturgeon* kept alive in Saint *Jameſes-Park*: of the moveable Teeth of *Pikes*: of young *Eeles* cut alive out of the old ones Belly: of the tranſporting Fiſh-ſpawn, and *Carps* alive from one place to another: of the ſtrange increaſe of *Carps* ſo tranſported: of *Snake-ſtones* and other *Antidotes*: of *Frogs*, *Frog-ſpawn*, *Toads*, *Newts*, *Vipers*, *Snakes*, *Rattle-Snakes*.

Relations of ſeveral kinds of *Poyſons*, as that of *Maccaſſer*, and *Florence*: of *Crawfiſhes*: of the Generation, growth, life, and transformation of *Ants*: of *Cheeſe worms* leaping like *Fleas*: of living Worms found in the Entrails of *Fiſhes*: of *Inſects* found in the ſheathing of Ships: of the generation of *Inſects*, out of dead *Cantharides*: of *Inſects* bred in mens Teeth, Gums, Fleſh, Skin: of great quantities of *Flies* living in Winter, though frozen: of the wayes of ordering *Silk-worms* in *France*, *Italy*, *Virginia*: and of their not being hurt in *Virginia* by Thunder. *Re-*

Relations of *Swallows* living after they have been frozen under water: of *Barnacles* and *Soland Geese*: of a new way of hatching *Pigeons*: of the way of hatching *Chickens* in *Egypt*: of *Eggs* proving fruitful, after they had been frozen: of recovering a *tir'd Horse* with *Sheeps blood*.

Relations of several Monsters with their Anatomies: of the measure of a Giant-child: of Stones found in several parts of the Body: of an unusual way of cutting the Stone out of the *Bladder*: of a Womans voiding the *Bones* of a *Child* out of her side eighteen years after her having been *with child*: of grafting Teeth, and making the Teeth of one Man grow in the mouth of another.

Relations of several *Chirurgical* operations: of renewing the beating of the heart, by blowing into the *Receptaculum chyli*: of the *Art* of perfectly restoring Nerves, transversly cut, practis'd in *France*: of a *Mummy* found in the Ruines of Saint *Pauls*, after it had lain buried above 200. years: of breaking the Nerve to the *Diaphragm*, and of its effects: of cutting a *Stetoma* out of a Womans Breast: of making the blood *Florid* with *Volatil*, and *Coagulating* with *Acid* Salts.

Relations of Sympathetick Cures, and Trials: of the effects of *Tobacco-oyl* for casting into Convulsion fits: of *Moors* killing themselves by holding their Breaths: of walking on the Water by the help of a Girdle filled with Wind: of *Pendulum* Clocks: of several rare Guns, and Experiments with them: of new *Quadrants* and *Astronomical* Instruments: of Experiments of *refraction* made by the *French Academy*: of a way to make use of Eggs in painting, instead of Oyl: of the Island *Hirta* in *Scotland*: of the *Whispering place* at *Gloceſter*: of the *Pike* of *Tenariff*.

A

RELATION

OF THE

PICO TENERIFFE.

Receiv'd from ſome conſiderable Merchants and Men worthy of Credit, who went to the top of it.

"HAving furniſh'd our ſelves with a Guide, Ser-
"vants, and Horſes to carry our Wine and
"Proviſions, we ſet out from *Oratava*, a Port Town
"in the Iſland of *Tenariffe*, ſcituated on the North of
"it at two miles diſtant from the main Sea. We tra-
"velled from twelve at night till eight in the morn-
"ing, by which time we got to the top of the firſt
"Mountain towards the *Pico de Terraira*; here, un-
"der a very great and conſpicuous Pine tree, we
"brake our faſt, dined and refreſht our ſelves, till two
"in the afternoon; then we proceeded through
"much Sandy way, over many lofty Mountains, but
"naked and bare, and not covered with any Pine
"trees, as our firſt nights paſſage was: this expoſed
"us to exceſſive heat, till we arrived at the foot of
"the *Pico*; where we found many huge Stones, which
"ſeemed to have been fallen down from ſome up-
"per part.

"About

"About ſix a clock this evening, we began to "aſcend up the *Pico*, but being now a mile advanced, "and the way no more paſſable for our Horſes, we "quitted and left them with our Servants: In this "miles aſcent ſome of our company grew very faint "and ſick, diſorder'd by fluxes, vomitings, and Aguiſh "diſtempers, our Horſes hair ſtanding up right like "Briſtles: but calling for ſome of our Wine, which "was carried in ſmall Barrels on a Horſe, we found "it ſo wonderfully cold, that we could not drink it "till we had kindled a fire to warm it, although yet "the temper of the Air was very calm and mode- "rate. But when the Sun was ſet, it began to blow "with that violence, and grew ſo cold, that taking "up our lodging under certain great Stones in the "Rocks, we were conſtreined to keep great fires be- "fore the mouthes of them all night.

"About four in the morning we began to mount "again, and being come about a mile up, one of the "Company fail'd, and was able to proceed no fur- "ther. Here began the black Rocks. The reſt of "us purſued our Journey till we came to the *Sugar-* "*loaf*, where we begin to travel again in a white "ſand, being fore-ſhod with ſhooes whoſe ſingle ſoles "are made a finger broader than the upper leather, "to encounter this difficult and unſtable paſſage; "being aſcended as far as the black Rocks, which "are all flat, & lie like a pavement, we climbed with- "in a mile of the very top of the *Pico*, and at laſt we "gained the *Summit*, where we found no ſuch "ſmoak as appeared a little below, but a continual "breathing of a hot and ſulphurous Vapour, which "made our faces extreamly ſore.

"In this paſſage we found no conſiderable altera-

"tion of Air, and very little Wind; bnt being at the "top, it was ſo impetuous, that we had much ado to "ſtand againſt it, whilſt we drank the Kings health, "and fired each of us a peece. Here we alſo brake "faſt, but found our Strong-water had quite loſt its "force, and was become almoſt inſipid, whilſt our "Wine was rather more ſpirituous and briſque than "it was before.

"The top on which we ſtood, being not above a "yard broad, is the brink of a Pit called the *Caldera*, "which we judged to be about a Muſquet-ſhot over, "and neer fourſcore yards deep, in ſhape like a *Cone*, "within hollow like a Kettle or Cauldron, and all "over cover'd with ſmall looſe Stones mixt with "Sulphur and Sand, from amongſt which iſſue divers "Spiracles of ſmoak and heat, when ſtirred with any "thing puffs and makes a noiſe, and ſo offenſive, that "we were almoſt ſtifled with the ſudden Emanation "of Vapours upon the removing of one of theſe "Stones, which are ſo hot as they are not eaſily to be "handled. We deſcended not above four or five "yards into the *Caldera*, in regard of its fliding from "our feet and the difficulty. But ſome have ad-"ventured to the bottom. Other obſervable mate-"rials we diſcover'd none, beſides a clear ſort of *Sul-"phur*, which looks like Salt upon the Stones.

"From this famous *Pico*, we could ken the *Grand "Canaria*, fourteen leagues diſtant, *Palma* eighteen, "and *Gomera* ſeven leagues, which interval of Sea "ſeemed to us not much larger than the River of "*Thames* about *London*: We diſcerned alſo the *Her-"ro*, being diſtant above twenty leagues, and ſo to the "outmoſt limits of the Sea much farther.

"So ſoon as the Sun appeared, the ſhadow of the

"*Pico*

"*Pico* ſeemed to cover, not only the whole Iſland, and "the *Grand Canaries*, but the Sea to the very *Hori-* "*ſon*, where the top of the *Sugar-loaf* or *Pico* viſibly "appeared to turn up and caſt its ſhade into the Air "it ſelf, at which we were much ſurpriſed: But the "Sun was not far aſcended, when the Clouds began "to riſe ſo faſt, as intercepted our proſpect both of "the Sea, and the whole Iſland, excepting only the "tops of the ſubjacent Mountains, which ſeem'd to "pierce them through: Whether theſe Clouds do "ever ſurmount the *Pico* we cannot ſay, but to ſuch "as are far beneath, they ſometimes ſeem to hang a- "bove it, or rather wrap themſelves about it, as con- "ſtantly when the North-weſt Wind blows; this "they call the *Cappe*, and is a certain prognoſtick of "enſuing Storms.

"One of our company, who made this journey "again two years after, arriving at the top of the *Pi-* "*co* before day, and creeping under a great Stone "to ſhrowd himſelf from the cold Air (after a little "ſpace) found himſelf all wet, and perceived it to "come from a perpetual trickling of water from "the Rocks above him. Many excellent and very "exuberant Springs we found iſſuing from the tops "of moſt of the other Mountains, guſhing out in "great Spouts, almoſt as far as the huge Pine tree "which we mention'd.

"Having ſtay'd ſome time upon the top, we all "deſcended by the Sandy way till we came to the "foot of the *Sugar-loaf*, which being ſteep, even to "almoſt a perpendicular, we ſoon paſſed. And here "we met a Cave of about ten yards deep, and fifteen "broad, being in ſhape like an Oven or *Cupola*, having "a hole at the top which is neer eight yards over;

"by this we deſcended by a Rope, which our Ser-
"vants held at the top, whilſt the other end being
"faſtned about our middles, we ſwing our ſelves,
"till being over a Bank of Snow, we ſlide down and
"light upon it. We were forced to ſwing thus in
"the deſcent, becauſe in the middle of the bottom
"of this Cave, oppoſite to the overture at the top, is
"a round Pit of water, reſembling a Well, the ſur-
"face whereof is about a yard lower than the Snow,
"but as wide as the mouth at top, and is about ſix
"fathom deep. We ſuppoſe this Water not a Spring,
"but diſſolved Snow blown in, or Water trickling
"through the Rocks.

"About the ſides of the Grot, for ſome height,
"there is Ice and Icicles hanging down to the Snow.
"But being quickly weary of this exceſſive cold
"place, and drawn up again, we continued our de-
"ſcent from the Mountains by the ſame paſſages we
"went up the day before, and ſo about five in the
"evening arrived at *Oratava*, from whence we ſet
"forth, our Faces ſo red and ſore, that to cool them,
"we were forced to waſh and bathe them in Whites
"of Eggs, *&c.*

"The whole height of the *Pico* in perpendicular
"is vulgarly eſteem'd to be two miles and a half. No
"Trees, Herbs, or Shrubs in all the paſſage but Pines,
"and amongſt the whiter Sands a kind of Broom,
"being a buſhy Plant; and at the ſide where we lay
"all night, a kind of *Cordon*, which hath Stems of
"eight foot high, the Trunk near half a foot thick,
"every Stem growing in four ſquares, and emerging
"from the ground like Tuffets of Ruſhes; upon the
"edges of theſe Stems grow very ſmall red Buttons
"or Berries, which being ſqueezed produc'd a poy-
"ſonous

"ſonous Milk, which lighting upon any part of a "Horſe, or other Beaſt, fetches off the hair from the "skin immediately; of the dead part of this we "made our fires all night. This Plant is alſo univer- "ſally ſpread over the Iſland, and is perhaps a kind "of *Euphorbium*.

"Of the Iſland *Tenariffe* it ſelf, this account was "given by a Judicious and Inquiſitive Man, who liv'd "twenty years in it as a Phyſician and Merchant. "His opinion is, that the whole Iſland being a ground "mightily impregnated with Brimſtone, did in for- "mer times take fire, and blow up all or near upon "all at the ſame time, and that many Mountains of "huge Stones calcin'd and burnt, which appear eve- "ry where about the Iſland, eſpecially in the South- "weſt parts of it, were rais'd and heav'd up out of "the Bowels of the Earth, at the time of that ge- "neral conflagration; and that the greateſt quanti- "ty of this Sulphur lying about the Center of the "Iſland, raiſed up the *Pico* to that height at which it "is now ſeen. And he ſayes, that any one upon the "place that ſhall carefully note the ſcituation, and "manner of theſe calcin'd Rocks how they lie, will "eaſily be of that mind: For he ſayes, that they lye "for three or four miles almoſt round the bottom of "the *Pico*, and in ſuch order one above another al- "moſt to the very *Sugar-loaf* (as 'tis called) as if "the whole ground ſwelling and riſing up together "by the Aſcenſion of the Brimſtone, the Torrents "and Rivers of it did with a ſudden Eruption rowl "and tumble them down from the reſt of the Rocks, "eſpecially (as was ſaid before) to the South-weſt; "For on that ſide, from the very top of the *Pico* al- "moſt to the Sea ſhore, lye huge heaps of theſe burnt

"Rocks

"Rocks one under another. And there remain to "this time the very Tracts of the Rivers of Brim- "ſtone, as they ran over all this quarter of the Iſland, "which hath ſo waſted the ground beyond recove- "ry, that nothing can be made to grow there but "Broom: But on the North ſide of the *Pico*, few or "none of theſe Stones appear. And he concluded "hence, that the *Volcanio* diſcharg'd it ſelf chiefly to "the South-weſt. He adds further, that Mines of "ſeveral Mettals were broken and blown up at the "ſame time. Theſe calcin'd Rocks reſembling ſome "of them Iron-Ore, ſome Silver, and others Copper. "Particularly at a certain place in theſe South-weſt "parts called the *Azuleios*, being very high Moun- "tains, where never any Engliſh man but himſelf "(that ever he heard of) was. There are vaſt quan- "tities of a looſe blewiſh Earth intermixt with blew "Stones, which have on them yellow ruſt as that of "Copper and Vitriol: And likewiſe many little "Springs of Vitriolate waters, where he ſuppoſes was "a Copper Mine. And he was told by a Bell-founder "of *Oratava*, that out of two Horſe loads of this "Earth, he got as much Gold as made two large "Rings. And a *Portuguez* told him, who had been "in the *Weſt-Indies*, that his opinion was, there were "as good Mines of Gold and Silver there as the beſt "in the *Indies*. There are likewiſe hereabout Ni- "trous Waters and Stones covered with a deep Saf- "fron colour'd ruſt, and taſting of Iron. And fur- "ther he mentions a Friend of his, who out of two "lumps of Earth or Ore, brought from the top of "this ſide the Mountain, made two Silver-ſpoons. All "this he confirms from the late inſtance of the *Palme* "Iſland eighteen leagues from *Tenariffa*, where a

"*Volcanio*

"*Volcanio* was fired about twelve years ſince, the vio-
"lence whereof made an Earthquake in this Iſland
"ſo great, that he and others ran out of their houſes,
"fearing they would have fallen upon their heads.
"They heard the noiſe of the Torrents of flaming
"Brimſtone like Thunder, and ſaw the fire as plain
"by night, for about ſix weeks together, as a Candle
"in the room: And ſo much of the Sand and Aſhes,
"brought from thence by the Wind with Clouds,
"fell on his Hat, as fill'd a Sand box for his Ink-
"horn.

"In ſome part of this Iſland there grows a crook-
"ed Shrub which they call *Legnan*, which they bring
"for *England* as a ſweet Wood: There are likewiſe
"Abricots, Peaches, *&c.* in Standard, which bear
"twice a year, Pear-trees alſo which are as pregnant:
"Almonds of a tender ſhell; Palms, Plantains, Oran-
"ges and Lemmons, eſpecially the *Pregnadas* which
"have ſmall ones in their bellies, from whence they
"are ſo denominated. Alſo they have Sugar Canes,
"and a little Cotton. *Colloquintida, &c.* The Roſes
"blow at *Chriſtmas*. There are good Carnations, and
"very large; but Tulips will not grow or thrive
"there: Sampier clothes the Rocks in abundance,
"and a kind of Clover the Ground. Another Graſs
"growing neer the Sea, which is of a broader leaf, ſo
"luſcious and rank, as it will kill a Horſe that eats of
"it, but no other Cattle. Eighty ears of Wheat have
"been found to ſpring from one root, but it grows not
"very high. The Corn of this is tranſparent and
"bright like to the pureſt yellow Amber, and one
"buſhel hath produc'd one hundred and thirty in a
"ſeaſonable year.

"The Canary-birds (which they bring to us in
"*England*)

"*England*) breed in the *Barancos* or *Gills*, which the "Water hath fretted away in the Mountains, being "places very cold. There are alſo Quails, Partridges, "larger than ours and exceeding beautiful, great "Wood-pigeons, Turtles at Spring, Crows, and ſome-"times from the Coaſt of *Barbary* appears the Fal-"con. Bees are carried into the Mountains, where "they proſper exceedingly.

"They have wild Goats on the Mountains, which "climb to the very top of the *Pico* ſometimes: Alſo "Hogs and multitudes of Conies.

"Of Fiſh they have the Cherna, a very large and "excellent fiſh, better taſted than any we have in "*England*; the Mero, Dolphin, Shark, Lobſters "without the great claws, Muſſles, Periwinkles, & the "Clacas, which is abſolutely the very beſt Shell-fiſh "in the world, they grow in the Rocks five or ſix un-"der one great ſhell, through the top holes whereof "they peep out with their Nebs, from whence (the "ſhells being broken a little more open with a ſtone) "they draw them forth. There is likewiſe another "Fiſh like an Eel, which hath ſix or ſeven tails of a "ſpan in length united to one head and body, which "is alſo as ſhort. Beſides theſe, they have Turtles "and Cabridos which are better than our Trouts.

"The Iſland is full of Springs of pure Water ta-"ſting like Milk. And in *Lalaguna* (where the Wa-"ter is not altogether ſo Limpid and Clear) they "percolate it through a kind of ſpungy Stone cut in "form of a Baſon.

"The Vines which afford thoſe excellent Wines, "grow all about the Iſland within a mile of the Sea, "ſuch as are planted farther up are nothing eſteem'd, "neither will they thrive in any of the other Iſlands,

"for

"for the *Guanchios* or antient Inhabitants he gives "this full Account.

"*September* the third, about twelve years ſince, he "took his Journey from *Guimar* (a Town inhabited "for the moſt part by ſuch as derive themſelves from "the old *Guanchios*) in the company of ſome of them, "to view their Caves and the Bodies buried in them. "This was a favour they ſeldome or never permit to "any (having in great veneration the Bodies of their "Anceſtours, and likewiſe being moſt extreamly a-"gainſt any moleſtation of the Dead) but he had "done ſeveral *Eleemoſinary* Cures amongſt them (for "they are generally very poor, yet the pooreſt thinks "himſelf too good to marry with the beſt *Spaniard*) "which indeared him to them exceedingly, other-"ways it is death for any Stranger to viſit theſe Caves "or Bodies.

"Theſe Bodies are ſowed up in Goat-ſkins with "thongs of the ſame, with very great curioſity, par-"ticularly in the incomparable exactneſs and even-"neſs of the ſeams, and the Skins are made very cloſe "and fit to the body: Moſt of theſe Bodies are en-"tire, the eyes cloſed, hair on the head, ears, noſe, "teeth, lips, beard, all perfect, only diſcoloured and "a little ſhriveld, likewiſe the *Pudenda* of both Sexes; "He ſaw about three or four hundred in ſeveral "Caves, ſome of them are ſtanding, others lie on beds "of Wood, ſo hardned by an art they had (which the "*Spaniards* call *Curar*, to cure a piece of wood) as "no Iron can pierce or hurt it. He ſays, that one day "being hunting a Ferret (which is much in uſe there) "having a bell about his neck, ran after a Coney in-"to a hole, where they loſt the ſound of the bell; "the owner being afraid he ſhould looſe his Ferret,

"ſeeking about the Rock and Shrubs, found the "mouth of a Cave, and entring in, was ſo afrighted, "that he cryed out. It was at the ſight of one of "theſe Bodies, very tall and large, lying with his head "on a great Stone, his feet ſupported with a little "wall of ſtone, the body reſting on a bed of Wood "(as before was mention'd.) The fellow being now a "little out of his fright entered it, and cut off a great "piece of the skin that lay on the breaſt of this body, "which, the Doctor ſayes, was more flexible and pli-"ant than ever he felt any Kids-leather-glove, and "yet ſo far from being rotten, that the man uſed it for "his Flail many years after.

"Theſe bodies are very light, as if made up of "ſtraw, and in ſome broken Limbs he obſerved the "Nerves and Tendons, and alſo ſome ſtrings of the "Veins and Arteries very diſtinctly.

"His great care was to enquire of theſe people "what they had amongſt them of Tradition con-"cerning the embalming and preſervation of theſe "Bodies: from ſome of the eldeſt of them (above "a hundred and ten years of age) he received this "Account, That they had of old one particular "Tribe of men that had this Art amongſt themſelves "only, and kept it as a thing ſacred, and not to be "communicated to the Vulgar: Theſe mixt not with "the reſt of the Inhabitants, nor married out of their "own Tribe, and were alſo their Prieſts and Miniſters "of Religion: That upon the Conqueſt of the *Spa-*"*niards* they were moſt of them deſtroy'd, and the "Art loſt with them, only they held ſome Traditions "yet of a few Ingredients, that were made uſe of "in this buſineſs. They took Butter of Goats Milk "(ſome ſaid Hogs Greaſe was mingled with it) which

"they

"they kept in the Skins for this purpoſe, in this they "boyled certain Herbs; firſt a ſort of wild Lavender, which grows there in great quantities on the "Rocks: Secondly, an Herb called Lara, of a very "gummy and glutinous Conſiſtence, which now "grows there under the tops of the Mountains only; "Thirdly, a kind of Cyclamen or Sow-bread: Fourthly, wild Sage, growing plentifully in this Iſland: "Theſe with others bruiſed and boiled in the Butter, render'd it a perfect Balſame. This prepared, "they firſt unbowelled the Corps (and in the poorer "ſort, to ſave charges, they took out the Brain behind, and theſe poor were alſo ſew'd up in Skins "with the hair on, whereas the richer ſort were (as "was ſaid before) put up in Skins ſo finely and exactly dreſſed, as they remain moſt rarely pliant and "gentle to this day.) After the Body was thus ordered, they had in readineſs a *Lixivium* made of "the Bark of Pine trees, with which they waſht the "Body, drying it in the Sun in Summer, and in Stoves "in Winter, this repeating very often. Afterward "they began their Unction with the Balſame, both "without and within, drying it again as before. This "they continued till the Balſame had penetrated into the whole habit, and the Muſcles in all parts appeared through the contracted Skin, and the Body "became exceeding light: Then they ſew'd them "up in the Goat-skins, as was mention'd already. He "was told by theſe Ancient People, that they have "above twenty Caves of their Kings and great Perſons, with their whole Families, yet unknown to any "but themſelves, and which they will never diſcover. "Laſtly, he ſayes that Bodies are found in the Caves "of the *Grand Canaria* in ſacks, and quite conſumed,

"not as theſe in *Teneriffa*. Thus far of the Bodies and "embalming.

"Antiently when they had no knowledge of Iron, "they made their Lances of Wood hardned as be- "fore, ſome of which the Doctor hath ſeen. He hath "alſo ſeen Earthen-pots ſo hard, that they cannot be "broken; of theſe ſome are found in the Caves and "old *Bavances*, and uſed by the poorer people that "find them to boyl meat in. Likewiſe they did *Cu-* "*ror* Stone it ſelf, that is to ſay, a kind of Slate called "now *Tobona*, which they firſt formed to an edge or "point as they had occaſion to uſe it, either as Knives "or Lancets to let blood withall.

"Their Food is Barly roaſted, and then ground with "little Mills, which they made of Stone, and mixt "with Milk and Honey: This they ſtill feed on, "and carry it on their backs in Goat-skins.

"To this day they drink no Wine, nor care for "Fleſh. They are generally very lean, tall, active and "full of courage.

"He himſelf hath ſeen them leap from Rock to "Rock, from a very prodigious height, till they "came to the bottom, ſometimes making ten fathom "deep at one leap.

"The manner is thus:

"Firſt they *Tertiate* their Lance (which is about "the bigneſs of a half Pike) that is, they poiſe it "in their hand, then they aim the point of it at any "piece of a Rock, upon which they intend to light "(ſometimes not half a foot broad.) At their going "off they clap their feet cloſe to the Lance, and ſo "carry their bodies in the Air. The point of the "Lance firſt comes to the place, which breaks the "force of their fall; then they ſlide gently down

"by

"by the Staffe, and pitch with their feet upon the "very place they firſt deſigned, and from Rock to "Rock till they come to the bottome. Their "Novices ſometimes break their necks in learn-"ing.

"He added ſeveral Stories to this effect of their "great activity in leaping down Rocks and Cliffs. "And how twenty eight of them made an eſcape "from the battlements of an extraordinary high Ca-"ſtle in the Iſland, when the Governour thought he "had made ſure of them.

"He told alſo (and the ſame was ſeriouſly con-"firmed by a *Spaniard*, and another *Canary* Mer-"chant then in the company) That they whiſtle ſo "loud as to be heard five miles off. And that to be "in the ſame Room with them when they whiſtle, "were enough to indanger breaking the *Tympanum* "of the ear, and added, that he (being in Compa-"ny of one that whiſtled his loudeſt) could not "hear perfectly for fifteen dayes after, the noiſe was "ſo great.

"He affirms alſo, That they throw Stones with a "force almoſt as great as that of a Bullet, and now "uſe Stones in all their fights as they did ancient-"ly.

When

When my *Reader* ſhall behold this large number of *Relations*; perhaps he will think, that too many of them ſeem to be incredulous ſtories, and that if the *Royal Society* ſhall much buſie themſelves, about ſuch wonderful, and uncertain *events*, they will fall into that miſtake, of which I have already accus'd ſome of the *Antients*, of framing *Romances*, inſtead of ſolid *Hiſtories* of Nature. But here, though I ſhall firſt confirm what I ſaid before; that it is an unprofitable, and unſound way of *Natural Philoſophy*, to regard nothing elſe but the prodigious, and extraordinary *cauſes*, and *effects*: yet I will alſo add, that it is not an unfit employment for the moſt judicious *Experimenter* to examine, and record the moſt unuſual and monſtrous forces, and motions of *matter*: It is certain that many things, which now ſeem *miraculous*, would not be ſo, if once we come to be fully acquainted with their *compoſitions*, and *operations*. And it is alſo as true, that there are many *Qualities*, and *Figures*, and *powers* of things, that break the common Laws, and tranſgreſs the ſtanding Rules of *Nature*. It is not therefore an extravagance, to obſerve ſuch *productions*, and are indeed *admirable* in themſelves, if at the ſame time we do not ſtrive to make thoſe appear to be *admirable*, that are groundleſs, and falſe. In this there is a neer reſemblance between *Natural* and *civil Hiſtory*. In the *Civil*, that way of *Romance* is to be exploded, which heightens all the characters, and actions of men, beyond all ſhadow of *probability*: yet this does not hinder, but the great, and eminent *virtues* of extraordinary men of all Ages, may be related, and propos'd to our example. The ſame is to be affirm'd of *Natural Hiſtory*. To make that only to conſiſt of ſtrange, and delightful Tales, is to render it nothing

nothing elſe but *vain*, and *ridiculous Knight-Errantry*. Yet we may avoid that extreme, and ſtill leave room, to conſider the ſingular, and irregular *effects*, and to imitate the unexpected, and monſtrous *exceſſes*, which *Nature* does ſometimes practiſe in her *works*. The firſt may be only compar'd to the Fables of *Amadis*, and the *Seven Champions*: the other to the real *Hiſtories* of *Alexander*, *Hannibal*, *Scipio*, or *Cæſar*: in which though many of their Actions may at firſt ſurprize us; yet there is nothing that exceeds the *Truth* of *Life*, and that may not ſerve for our *inſtruction*, or *imitation*.

§. XXXIII. *The Experiments they have try'd,*

If this way of general receiving all credible accounts of *Natural*, and *Artificial productions*, ſhall ſeem expos'd to overmuch hazard, and uncertainty: that danger is remov'd by the *Royal Societies* reducing ſuch matters of here-ſay and information, into real, and impartial *Trials*, perform'd by their own *hands*: Of the exactneſs, variation, and accurate repetition of their *Experiments*, I have already diſcours'd: I will now go on to lay down in ſhort compaſs thoſe parts of the viſible World, about which they have chiefly beſtow'd their *pains*.

Of Fire.

The firſt kind that I ſhall mention, is of *Experiments* about *Fire*, and *Flame*, of theſe many were made in order to the examination of a *Theory* propounded to them, that there is no ſuch thing, as an *Elementary Fire* of the *Peripatetics*; nor *Fiery Atoms* of the *Epicureans*: but that *Fire* is only the Act of the diſſolution of heated *Sulphureous Bodies*, by the *Air* as a *Menſtruum*, much after the ſame manner, as *Aqua Fortis*, or other ſharp *Menſtruums* do work on diſſoluble

luble Bodies, as *Iron*, *Tin*, *Copper*: that heat, and light are two inſeparable effects of this diſſolution, as heat, and ebullition are of thoſe diſſolutions of *Tin*, and *Copper*: that *Flame* is a diſſolution of *Smoak*, which conſiſts of combuſtible particles, carry'd upward by the heat of rarify'd *Air*: and that *Aſhes* are a part of the *Body* not diſſoluble by the *Air*.

Of this ſort, they have made *Experiments*, to find the laſting of the burning of a Candle, Lamp, or Coals, in a Cubic foot of common, rarify'd, and *condens'd Air*: to exhibite the ſudden extinction of Candles, Lamps, and lighted Coals, when they are put into *ſatiated Air*: to ſhew the ſpeedy extinction of kindled Charcoals, by blowing on them with bellows, that *Air* which had before been ſatiated with burning: to ſhew that the greateſt and moſt laſting heat, without a ſupply of freſh *Air*, is unable to burn Wood, Sulphur, and moſt other combuſtible matters: to find the comparative heat of all kinds of *Fires*, and *Flames* of ſeveral Materials, as of Sulphur, Camphire, Spirit of Wine, Oyl, Wood, Coal, Seacoal, Iron: to find at what degree of heat, Lead, Tin, Silver, Braſs, Copper, Gold will melt.

Experiments of the Tranſparency, and Refractedneſs of *Flames*: of diſcerning the ſtrength of ſeveral kinds of Gunpowder, *Pulvis Fulminans*, *Aurum Fulminans*: of Gunpowder in the exhauſting Engine: of bending Springs by the help of Gunpowder: of melting Copper immediately, by the help of a Flux-powder: of the Recoyling of Guns.

Experiments of Candles, and Coals, extinguiſh'd by the damps of a deep Well: of the burning of Lamps under water: of burning Spirit of Wine, and Camphire together, and the diverſity of their *Flames*: of

reducing

reducing Copper to a very combuſtible ſubſtance: of heating the *Air*, by blowing it through a red-hot earthen *Pipe*, ſo as to burn Wood: of the brightneſs of the *Flame* of *Niter*, and *Sulphur*: of the burning and flaming of Tin-filings by the help of *Niter*: of kindling Bodies, in common, rarify'd, and condens'd *Air*, by the help of a *Burning-glaſs*: of the comparative heat caſt by a *Burning-glaſs*, in the morning, and at noon: of burning with a *Lens* made of Ice: of calcining *Antimony* in the Sun with'loſs: to find whether *Aurum Fulminans* or *Pulvis Fulminans* do flame upon *Exploſion*: of hatching *Eggs* with a Lamp Furnace.

Their ſecond ſort of *Experiments* is of thoſe that have been made in order to find out the nature, properties, and uſes of *Air*. Such as theſe. *Of Air.*

Experiments for determining the height of the *Atmoſphere*, for finding the preſſure of the *Atmoſphere*: on the tops of Mountains, on the ſurface of the earth, and at the bottoms of very deep Pits, and Mines, by the help of *Quick-ſilver*, and other contrivances: for finding the preſſure of the *Atmoſphere*, both in the ſame place, and places very far removed.

Experiments to determine the poſſible bounds of expanſion, and condenſation of the *Air*, by heat and cold, by exhauſting and compreſſing: to determine the ſtrength of *Air* under the ſeveral degrees of *rarefaction*, and *condenſation*: of the force of condens'd *Air* in Wind-Guns: to ſtate the comparative gravity of the *Air* to other fluid, and ſolid Bodies: to diſcover the refractive power of the *Air*, under the ſeveral Degrees of *rarefaction*, and *condenſation*: to manifeſt the inflective veins of the *Air*: to produce a kind of opacity of the *Air*: of the falling of Smoak in rari-

fy'd *Air*: to make ſmall *Glaſs-bubbles* ſwim in *Air* very much condens'd: of *Glaſs-balls* riſing in a heavy, or condens'd *Air*, and falling in a lighter and more rarify'd.

Experiments of the Propagation of Sounds through common, rarify'd, and condens'd *Air*: of the congruity, or incongruity of *Air*, and its capacity to penetrate ſome Bodies and not others: of generating *Air* by corroſive *Menſtruums* out of fermenting Liquors, out of Water, and other Liquors, by heat, and by exhauſtion: of the returning of ſuch *Air* into the *Water* again: of the vaniſhing of *Air* into *Water* exhauſted of *Air*: of the maintaining, and increaſing a *Fire* by ſuch *Airs*: of the fitneſs, and unfitneſs of ſuch *Air* for reſpiration: of the uſe of *Air* in breathing.

Experiments of keeping Creatures many hours alive, by blowing into the *Lungs* with Bellows, after that all the *Thorax*, and *Abdomen* were open'd and cut away, and all the Intrails ſave *Heart* and *Lungs* remov'd: of reviving *Chickens*, after they have been ſtrangled, by blowing into their *Lungs*: to try how long a man can live, by expiring, and inſpiring again the ſame *Air*: to try whether the *Air* ſo reſpired, might not by ſeveral means be purify'd, or renew'd: to prove that it is not the heat, nor the cold of this reſpired *Air*, that choaks.

Experiments of the reſpiring of *Animals*, in *Air* much rarify'd, and the fatal effects: of the long continuance of ſeveral *Animals* very well in *Air*, as much condens'd, as it will be under water, at two hundred fathoms deep, that is about eight times: of the quantity of freſh *Air* requiſite for the life of a reſpiring *Animal*, for a certain ſpace of time: of making *Air* unfit for reſpiration, by ſatiating it, by ſuffering Candles,

dles, or Coals to burn in it, till they extinguiſh themſelves.

Experiments of including living *Animals*, and kindled Coals, and Candles, in a large Glaſs, to obſerve which of them will be firſt extinguiſh'd: of a mans living half an hour, without any inconvenience, in a *Leaden Bell*, at divers fathoms under water: of the Quantity of *Air* reſpir'd at once by a Man: of the ſtrength a Man has to raiſe Weights by his breath.

Experiments of the ſwelling of an Arm put into the rarifying Engine, by taking off the preſſure of the *Ambient Air*: of the ſwelling of Vipers, and Frogs, upon taking off the preſſure of the *Ambient Air*: of the life, and free motion of Fiſhes in Water, under the preſſure of *Air* eight times condens'd: of Inſects not being able to move in exhauſted *Air*: of the reſiſtance of *Air* to bodies mov'd through it: of the not growing of Seeds for want of *Air*: of the growing of Plants hung in the *Air*, and of the decreaſe of their weight: of the living of a Cameleon, Snakes, Toads, and divers Inſects, in a free *Air*, without food: of conveying *Air* under Water to any depth: of condenſing *Air* by *Water*, and by the expanſion of freezing *Water*: of the ſwelling of *Lungs* in the rarifying Engine: of the velocity, and ſtrength of ſeveral *Winds*.

The third kind are thoſe, which have been made, about the ſubſtance, and properties of *Water*: Such are, *Of Water.*

Experiments about the Comparative Gravity of *Salt Water*, and *freſh*, and of ſeveral *Medicinal Springs* found in this Nation: of the differing weight of the *Sea-water*, in ſeveral Climats, and at ſeveral Seaſons:

of the weight of *Diſtill'd-water*, *Snow-water*, *May-dew*, *Rain-water*, *Spring-water*: of augmenting the weight of *Liquor*, by diſſolving *Salts*: of the greater thickneſs of ſuch *Water*, at the bottom, than at the top: of weighing, aſcending, and deſcending Bodies in *Water*: of the preſſure of the *Water* at ſeveral depths under its ſurface.

Experiments of the heat and cold of the *Water*, at ſeveral depths of the *Sea*: of propagating ſounds through the *Water*: of ſounding the depth of the Sea without a line: of fetching up *Water* from the Bottom of the Sea: of fetching up Earth, Sand, Plants, from the bottom of the Sea.

Experiments of the reſiſtance of *Water* to Bodies mov'd on its ſurface, of ſeveral Figures, and by ſeveral degrees of force: of the reſiſtance of *Water* to Bodies mov'd through its ſubſtance aſcending, and diſcending: of the expanſion, and condenſation of *Water* by heat and cold: of the condenſation of *Water* by ſeveral wayes of preſſure: of converting *Water* into a vapourous *Air*, laſting ſometimes in that form: the *Torricellian Experiment* try'd with *Water* in a *Glaſs-cane* thirty ſix and forty foot high, in a leaden *Tube*, alſo with a Glaſs at the top: the ſame try'd with Oyl, and other Liquors.

Experiments of the riſing of *Water* in ſmall *Tubes*, and many others about its congruity: of filtration, or of the riſing of *Water*, to a great height in Sand, *&c.* of the ſwimming of Fiſhes: of *Waters* being able to penetrate through thoſe Pores, where *Air* will not: of opening bellows at a depth under *water*, and blowing up Bladders, to find the preſſure of the *Water*: of *Water* not ſubſiding in a high Glaſs-cane, upon removing the ambient preſſure, after it had been well exhauſted

hauſted of the *Air-bubbles* that lurk'd in it: of forcing *Water* out of a Veſſel by its own vapours.

Experiments of the different weight, and refraction of warm *Water*, and cold: of the paſſing of *Water* through the coats of a Mans ſtomach: of the living of Fiſh in *Water*, the *Air* being exhauſted: of cloſing up a Fiſh in a Glaſs of *water*: of the dying of Fiſhes in *Water*, upon taking off the preſſure of the *Air*, in the rarifying Engine: of *Hydroſtaticks*, and making a Body ſink by pouring more *water* upon it: of raiſing *Water* above its Standard by ſucking: of the ſubſiding of *Water* in the ſtem, upon putting the Bolt-head into warm *water*: of the ſhrinking of *Water* upon cooling.

The fourth kind are about *Mines*, *Metals*, *Oars*, *Stones*, *&c.* Such as, *Of Metals and Stones.*

Experiments of *Coppelling* made at the Tower: of diſſolving many Salts in one Liquor: of the *Oculus Mundi*: of *Ruſma*: of the Tenacity of ſeveral *Metals* examin'd by weights: of the rarefaction and condenſation of Glaſs: of the volatizing *Salt of Tartar*, with burnt Allom, with Vinegar, and Spirit of Wine: on the *Bononian Stone*: on *Diamonds*, of their ſhining by rubbing: on *Copper-oar*: of the diſtillation of *Coal*: of refining ſeveral kinds of *Lead-oar*: of extracting a much greater quantity of *Silver* out of that Oar, than is commonly done: of ſeveral wayes of reducing *Litharges* into *Lead*: of changing *Gold* into *Silver*.

Experiments Magnetical, of the beſt form of capping *Loadſtones*: of the beſt forms of *Needles*, of ſeveral lengths and bigneſſes: of various wayes of touching *Needles* on the *Loadſtone* of making the ſame Pole of the

the *Loadſtone*, both attract, and chaſe the ſame end of the *Needle* without touching it: to find the variation of the *Loadſtone* here at *London*.

Experiments with the dipping *Needle*: of the extraordinary ſtrength in proportion to its bulk of a ſmall *Loadſtone*: to meaſure the ſtrength of the *Magnetical* attractive power, at ſeveral diſtances from the *Stone*: to examine the force of the attractive power, through ſeveral *Mediums*, as Water, Air, Wood, Lead, and Stone: to divert the attractive power, by interpoſing Iron: to find the directive virtue of the *Loadſtone* under water.

Experiments to manifeſt by the help of Steel-duſt, the lines of the Directive virtue of the *Loadſtone* to be oval, in a contrary Poſition to what *Des Cartes Theory* makes them: to manifeſt thoſe lines of Direction by the help of *Needles*: to diſcover thoſe lines of Direction, when the influence of many *Loadſtones* is compounded: to find what thoſe lines are incompaſſing a *Sphærical Loadſtone*, what about a Square, and what about a regular Figure: to bore through the *Axis* of a *Loadſtone*: and fill it up with a *Cylindrical Steel*: *Experiments* on *Loadſtones* having many Poles, and yet the *Stones* ſeeming uniform.

Of Vegetables. The fifth kind is of the growth of *Vegetables* in ſeveral kinds of Water; as *River-water*, *Rain-water*, *Diſtill'd-water*, *May-dew*: of hindring the growth of Seed Corn in the Earth, by extracting the Air: and furthering their growth, by admitting it: of ſteeping Seeds of ſeveral kinds: of inverting the Poſitions of *Roots*, and *Plants* ſet in the ground, to find whether there are values in the Pores of the Wood, that only open one way: of the decreaſe of the weight of

Plants

Plants growing in Air: of *Lignum Foſſile*: of the growing of ſome branches of *Roſemary*, by only ſprinkling the leaves with water: of *Camphire wood*: of Wood brought from the *Canaries*: of a ſtinking Wood brought out of the *Eaſt-Indies*: of the re-union of the *Bark* of *Trees* after it had been ſeparated from the *Body*.

Medicinal and Anatomical.

The ſixth are *Experiments Medicinal*, and *Anatomical*; as of cutting out the Spleen of a Dog: of the effects of Vipers biting Dogs: of a *Camæleon*, and its diſſection: of preſerving *Animals* in Spirit of Wine, Oyl of Turpentine, and other Liquors: of injecting various Liquors, and other Subſtances, into the veins of ſeveral creatures.

Experiments of deſtroying *Mites* by ſeveral Fumes: of the equivocal Generation of *Inſects*: of feeding a *Carp* in the Air: of making Inſects with Cheeſe, and Sack: of killing Water-Newts, Toads, and Sloworms with ſeveral Salts: of killing Frogs, by touching their skin, with Vinegar, Pitch, or Mercury: of a Spiders not being inchanted by a Circle of *Unicorns horn*, or *Iriſh Earth*, laid round about it.

Experiments with a Poyſon'd *Indian* Dagger on ſeveral *Animals*: with the *Maccaſſer* Poyſon: with *Florentine* Poyſon, and ſeveral *Antidotes* againſt it: of making Fleſh grow on, after it has been once cut off: of the grafting a *Spur* on the head of a *Cock*, and its growing: of the living of Creatures by Factitious Air: of the reviving of *Animals* ſtrangled, by blowing into their *Lungs*: of Fleſh not breeding Worms, when ſecur'd from Fly-blowings: of the ſuffocation of *Animals* upon piercing the *Thorax*: of hatching Silk-worms Eggs in rarify'd Air: of tranſtuſing the blood of one *Animal* into another.

The

Of ſenſible Qualities. The ſeventh ſort are about thoſe which are call'd *ſenſible Qualities:* as of freezing: of cold, and heat: of freezing Water freed from Air: of the time, and manner of the contraction in freezing luke-warm Water: of the temperature of ſeveral places, by ſeal'd *Thermometers*; as of ſeveral Countries; of the bottoms of deep Mines, Wells, Vaults, on the tops of Hills, at the bottom of the Sea.

Experiments of the contraction of Oyl of *Vitriol*, and divers other Oyls by *freezing*: of *freezing* bitter Tinctures: of *freezing* ſeveral ting'd Liquors, and driving all the tincture inward to the Center: of ſhewing Ice to be capable of various degrees of cold, greater than is requiſite to keep it Ice: of producing cold by the diſſolution of ſeveral Salts: of *freezing* Water without *blebs*: of a membranous ſubſtance ſeparable from the blood by *freezing*: of a *Thermometer* in rarify'd and condens'd Air: of very eaſie *freezing* of Oyl of Anniſeeds: of making a Standard of Cold by *freezing* diſtill'd-water.

Of other Qualities. The eighth are of *Rarity, Denſity, Gravity, Preſſure, Levity, Fluidity, Firmneſs, Congruity, &c.* as of the Nature of *Gravity*: of the cohæſion of two Flat Marbles: of compreſſing the Air with *Mercury* to find its ſpring: of the weights of Bodies, ſolid and fluid: of rarefaction, and condenſation by the help of *Mercury*: of the tenacity of ſeveral Bodies: of the turning of two very fluid Liquors into one ſolid maſs, by mingling them together.

Experiments for examining, whether the gravity of Bodies alter, according as they are carried a good way above, or below the ſurface of the Earth: of the ſtanding

ſtanding of *Mercury* well exhauſted, many inches, nay many feet, above its uſual ſtanding: of a *Wheel-Baro-Meter*: of the expanſion, and contraction of Glaſs, and Metals by heat and cold: of Spirit of Wine, and ſeveral ting'd Liquors by the help of a Glaſs Tube: the examination of *Monſieur Paſchals* Experiment, by many others.

The ninth are *Experiments* of *Light, Sound, Colours, Taſte, Smell*: as of two tranſparent Liquors producing an opacous one: of Ecchos and reflected *ſounds*: of Muſical *ſounds*, and *Harmonies*: of Colours, of the greater refraction of Water, than of Ice: of Refraction in a new Engine; of the Refraction of Glaſs of various ſhapes under Water: of deſtroying the ſhining of Fiſh by Oyl of *Vitriol*: of making a great light by rubbing two Chryſtals hard one againſt the other: of making a *deaf*, and *dumb* man to ſpeak. *Of light, ſound, &c.*

The tenth are *Experiments* of *Motion*: as of Glaſs drops ſeveral wayes order'd, and broken: of the velocity of the deſcent of ſeveral Bodies of divers fashions through ſeveral Liquors: of determining the velocity of Bodies falling through the Air; try'd by many wayes: of the *ſwift motion* of ſounds: of the irregular *motion* of the Oyl of Turpentine on Spirit of Wine; of the ſtrength of falling Bodies, according to the ſeveral Heights, from which they fall: of proportioning the ſhapes of Bodies, ſo as to make them fall together in the ſame time through differing *Mediums*. *Of Motion.*

Experiments of the ſwiftneſs of a Bullet ſhot with extraordinary Powder: of the beſt Figure of the weight

of a *Pendulum* for *Motion*: of the *Motion* of Pendulous Bodies of various figures: to determine the length of *Pendulums*: to find the velocity of the vibrations of a ſounding ſtring: to find the velocity of *motion*, propagated by a very long extended Wire: for explaining the inflection of a ſtreight motion into a circular, by a ſupervening attractive power towards the Center, in order to the explaining of the *motion* of the Planets.

Experiments of the circular and complicated *motion* of *Pendulums*, to explain the *Hypotheſis* of the Moons moving about the Earth: of comparing the *Motions* of a circular *Pendulum*, with the *motion* of a ſtreight one: of the propagation of *motion*, from one Body to another: of the reflection of *motion*: of the vibrating *motion* of *Quick-ſilver* in a crooked Pipe: imitating the *motion* of a *Pendulum*: of communicating of the ſtrength of Powder for the bending of Springs; and thereby for making artificial Muſcles, to command what ſtrength we deſire.

Chymical and Mechanical.

The eleventh are *Experiments Chymical, Mechanical, Optical*: as of reducing the Fleſh of Animals into a Liquor like blood, by diſſolving it in a certain *Menſtruum*: of a greater facility of raiſing Water in Pipes of a larger Bore: of brewing Beer with Bread, Barly, Oats, Wheat, and without malting: of precipitating *Tartar* out of *Wine* by ſeveral expedients: of a *Chymical* extraction of a volatil Spirit, and Salt out of Spunges: of examining *Aurum fulminans* after exploſion: of the diſſolution of *Manna* in Water, and of a chryſtallizing it again out of it, by evaporation.

Experiments of *volatizing* Salt of *Tartar* many wayes:

wayes: of examining the *mucilaginous* matter call'd *Star-ſhoot*: of examining our *Engliſh Teleſcopes*, and *Microſcopes*; and comparing them with ſuch as have been made at *Rome*: of making a volatil Salt with Oyl of *Turpentine*, and Sea-ſalt: of the Quantity of Spirits in *Cyder*: of the ſtrength of ſeveral Springs: of examining a Pump made with Bellows: of dying Silk with ſeveral *Jamaica* Woods: of finding the ſtrength of Wood of ſeveral kinds, for bearing: of finding the flexibility of various Woods, and determining the utmoſt extent of their yielding, and bending.'

Experiments about the gravity of Bodies made on the top of Saint *Pauls* Steeple, *Weſtminſter-Abby*, and ſeveral other high places; and in a Well of ſeventy Fathoms depth: examined about the *Virgula Divina*, wherein the common Aſſertions were found falſe: of the various refractions of ſeveral Liquors, in a new refractive Engine: of common Oyl of *Tobacco*, made by diſtillation in a Glaſs retort: of making the Object-glaſs of a *Microſcope*, to bear as large an Aperture as is deſir'd.

Of this their way of Experimenting I will here produce theſe Examples.

EXPERIMENTS

Of the Weight of Bodies increaſed in the FIRE:

Made at the Tower, and the Account brought in by my Lord *BROUNCKER*.

1. *Copper and Lead.*

	d.	gr.
THe Coppel weighed----	10.	8. 7/32
Lead----	4.	9.
Copper----	0.	6.
Into the fire all three----	14.	23 7/32
Out of the fire----	15.	4 8/32
Gained----	0.	5 1/32

Beſides what the Copel loſt in weight, ſuppoſed to be about three grains.

2. *Copper and Lead.*

	d.	gr.
Coppel----	10.	2 3/4
Lead----	4.	9.
Copper----	0.	6.
Into the fire all three----	14.	17 3/4
Out of the fire----	15.	1 22/32
Gained----	0.	7 17/32

3. *Lead.*

3. *Lead alone.*

	d.	gr.
Copel	10.	3 $\frac{22}{32}$
Lead	4.	9.
Into the fire both	14.	12 $\frac{22}{32}$
Out of the fire	14.	23 $\frac{12}{32}$
Gained	0.	10 $\frac{22}{32}$

4. *Lead alone.*

	d.	gr.
Copel	10.	10 $\frac{7}{8}$
Lead	4.	9.
Into the fire both	14.	19 $\frac{7}{8}$
Out of the fire	15.	1 $\frac{5}{64}$
Gained	0.	5 $\frac{12}{64}$

5. *Copel alone.*

	d.	gr.
Into the fire	10.	5.
Out of the fire	10.	1 $\frac{3}{8}$
Loſt	0.	3 $\frac{5}{8}$

6. *Copel alone.*

	d.	gr.
Into the fire	10. *wanting*	7 $\frac{1}{4}$
Out of the fire	10. *wanting*	9.
Loſt	0.	1 $\frac{1}{4}$.

EXPE-

EXPERIMENTS

Of a Stone called

OCULUS MUNDI

Made by Dr. *GODDARD*.

A *Small Stone of the kind, called by ſome Authors* Oculus Mundi, *being dry and cloudy, weighed* ——— 5 gr. $\frac{200}{256}$

The ſame being put under Water, for a night and ſomewhat more, became tranſparent, and, the ſuperficies being wiped dry, weighed ——— 6 gr. $\frac{1}{256}$

The difference between theſe two weights —— 0. $\frac{20}{256}$

The ſame Stone kept out of Water one day and becoming cloudy again, weighed ——— 5. $\frac{221}{256}$

which was more than the firſt weight ——— 0. $\frac{16}{256}$

The ſame being kept dry two dayes longer, weighed ——— 5. $\frac{202}{256}$

which was leſs than at firſt ——— 0. $\frac{7}{256}$

Being kept dry ſomething longer, it did not grow ſenſibly lighter.

Being put under Water for a night, and becoming again tranſparent, and wiped dry, the weight was 6. $\frac{3}{256}$

the ſame with the firſt, after putting in Water, and more than the laſt weight, after keeping of it dry 0. $\frac{11}{256}$

Another Stone of the ſame kind, being variegated with milky, white, and grey, like ſome ſort of Agates, while it lay under Water, was always invironed with little bubbles, ſuch as appear in water before boyling, next the ſides of the veſſel.

There

There were alſo ſome of the like bubbles on the ſurface of the water juſt over it; as if either ſome Exhalations come out of it, or that it did excite ſome fermentation in the parts of the water contiguous to it.

There was little ſenſible difference of Tranſparency in this Stone, before the putting under Water, and after: To be ſure the milky white parts continued as before, but more different in weight, than in the former. For whereas, before the putting into the water, the weight was 18 gr. $\frac{27}{128}$ *after it had lyen in about twenty four hours the weight was* 20 gr. $\frac{27}{128}$; *ſo the difference was*——— 1 gr. $\frac{18}{128}$

The ſame Stone was infuſed in the water ſcalding hot, and ſo continued for a while after it was cold, but got no more weight, than upon infuſing in the cold; neither was there any ſenſible difference in the weight both times.

An

An Account of a Dog diſſected.

By Mr. *HOOK.*

IN proſecution of ſome Inquiries into the Nature of Reſpiration in ſeveral Animals; A Dog was diſſected, and by means of a pair of bellows, and a certain Pipe thruſt into the Wind-pipe of the Creature, the heart continued beating for a very long while after all the Thorax and Belly had been open'd, nay after the Diaphragme *had been in great part cut away, and the* Pericardium *remov'd from the heart. And from ſeveral tryals made, it ſeem'd very probable, that this motion might have been continued as long almoſt as there was any blood left within the veſſels of the Dog: for the motion of the Heart ſeem'd very little chang'd after above an hours time from the firſt diſplaying the* Thorax; *though we found, that upon removing the Bellows, the Lungs would preſently grow flaccid, and the Heart begin to have convulſive motions; but upon removing the motion of the Bellows, the Heart recovered its former motion, and the Convulſions ceaſed. Though I made a* Ligature *upon all the great Veſſels that went into the lower parts of its Body, I could not find any alteration in the pulſe of the Heart; the circulation, it ſeems, being perform'd ſome other way. I con'd not perceive any thing diſtinctly, whether the Air did unite and mix with the Blood; nor did in the leaſt perceive the Heart to ſwell upon the extenſion of the Lungs: nor did the Lungs ſeem to ſwell upon the contraction of the Heart.*

EX-

Fig: 1.

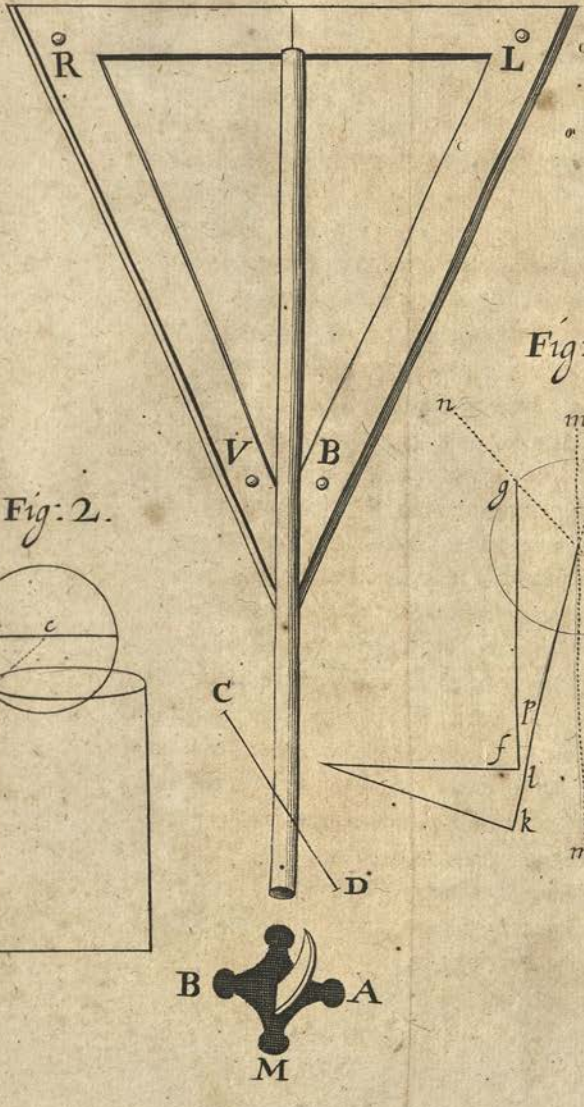


Fig: 2.

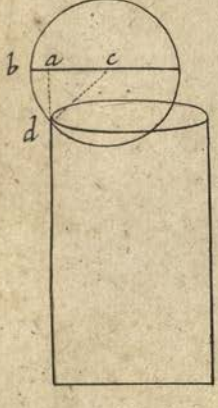
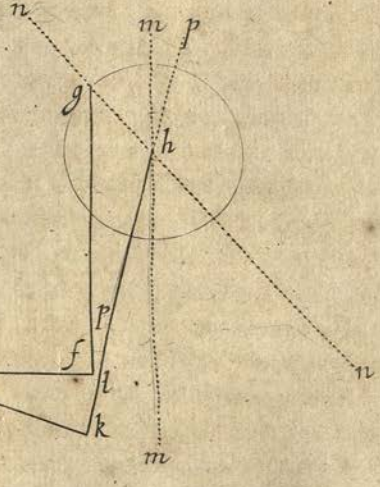


Fig: 3.



EXPERIMENTS

Of the Recoiling of

GUNS

By the Lord *BROUNCKER.*

WHen I was commanded by this Society, *to make some Experiments of the Recoiling of Guns: In order to the diſcovery of the cauſe thereof, I cauſed this Engine that lyes here before you to be prepared, and with it (aſſiſted by ſome of the moſt eminent of this* Society) *I had divers ſhots made in the Court of this Colledge, near the length thereof from the mark, with a full charge (about a fourpenny weight) of Powder; But without any other ſucceſs, then that there was nothing Regular in that way, which was by laying it upon a heavy table, unto which it was ſometimes faſtned with Screws at all the four places* R, L, V, B, *ſometimes only at* R *or* L, *having wheels affixed at* L *and* V *or* R *and* B, *that it might the more eaſily recoil.* Fig. 1.

This uncertainty I did then conceive might ariſe from one or more of theſe three cauſes, viz.

1. *The violent trembling motion of the Gun, whence the Bullet might caſually receive ſome lateral impulſe from the noſe of the peece at the parting from it.*

2. *The yielding of the Table which was ſenſible.*

3. *The difficulty of aiming well by the Sight and Button ſo far from the Mark.*

Therefore to avoid all theſe, the Experiments I caus'd to be made before you in the Gallery of this Colledge, you may be pleaſed to remember were performed, firſt, taking only eight grains of Powder for the charge. Secondly, laying the Engine upon the floor, and thirdly, aiming by a thread at M, *a mark about an Inch and* ¾ *from the mouth of the Gun (the edge of a knife being put for the mark the better to diſcern the line that was ſhot in) and they thus ſucceeded.*

When the piece was faſtned to the floor both at R *and* L, *the Bullet then did ſo fully hit the mark, that it was divided by it into two parts, whoſe difference in weight was leſs than ten grains (about the thirty third part of the whole Bullet) although the leſſer part was a little hollow, and that from which the neck of Lead was a little too cloſe pared off: But when hindred from Recoiling only at* R, *the Bullet miſt the mark towards* L *or* A, *for the whole Bullet, leſs than two grains excepted, went on that ſide: And in like manner when hindred from Recoiling at* L, *the Bullet miſt the mark towards* R *or* B, *the whole Bullet, leſs than two grains excepted, paſſing the knife on that ſide thereof.*

I had the honour to make other Experiments with the ſame Engine, lately at White-Hall *before his Majeſty and his Highneſs Royal within the* Tilt-yard *Gallery, where there is the hearth of a Chimney raiſed a little above the floor, about the diſtance of thirteen feet from the oppoſite wall, againſt which I cauſed a Plank to be placed, and the Engine to be laid firſt againſt the middle of the Hearth, that it might not recoil at all, and that part of the board to be marked againſt which 'twas levelled, known by a line ſtretched from the Breech of the Peece unto the Board, directly over the ſight and button, and the fire being given (the charge being but eight grains of Powder*

as

as before) the Bullet did fully hit the mark. Secondly, the Peece (charged and levelled in the ſame manner) was laid at the end of the Hearth next the Park, ſo that very little of the corner R *reſted againſt it, and then the Bullet miſs'd the mark about an inch and a quarter towards the Park or* A. *The like being done at the other end of the Hearth, the Bullet then miſs'd the mark as much the other way; and afterwards with double that charge ſomething more, as before I had found it leſs with a ſmaller charge.*

Since this (at firſt deſigning only to experiment the ſeveral diſtances that the bullet is carried wide of the mark with different charges of Powder) I made theſe Experiments following.

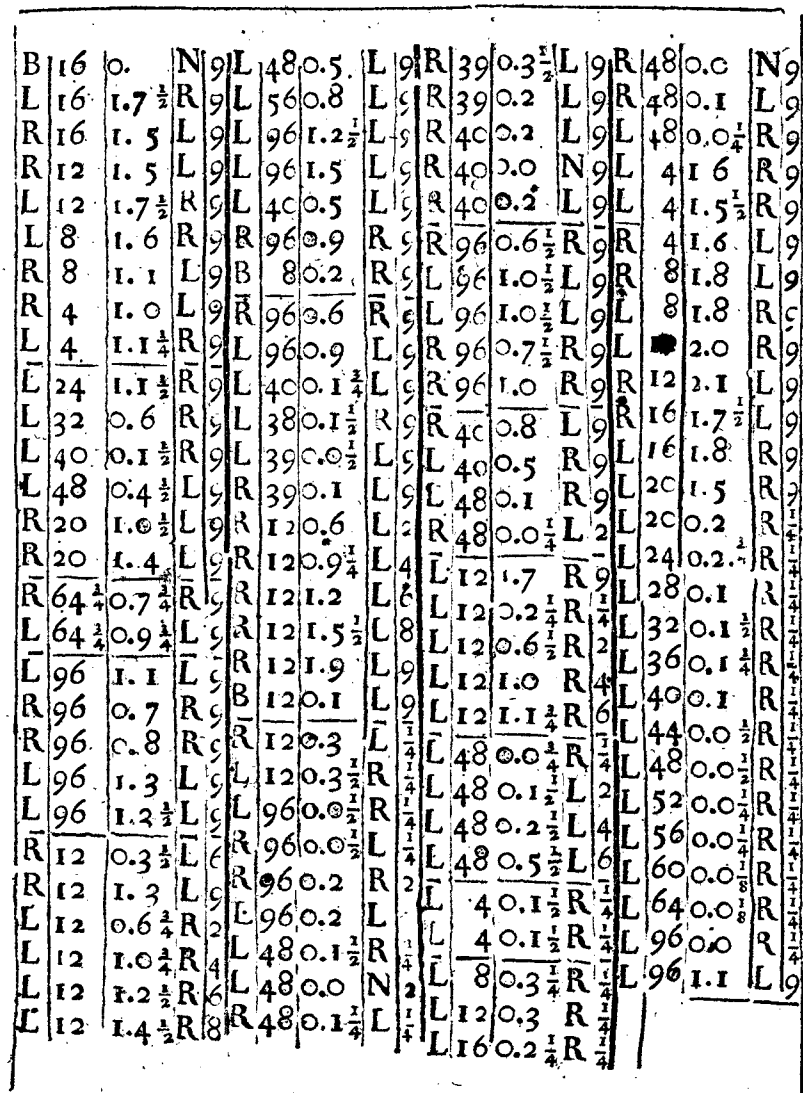
In the firſt Colume whereof you have the corner ſtopt from recoiling.

In the ſecond the grains of Powder with which the Peece was charged.

In the third the diſtance the Bullet was ſhot wide from the mark in inches, tenths, and parts of tenths.

In the fourth the ſide on which the Bullet was carried.

In the laſt the diſtance of the mark from the muzzle of the Gun in feet.



Whence

Whence you may be pleaſed to obſerve:

Firſt, That the recoil of the Peece being hindred only at R *or* L, *whatſoever be the charge of the Powder, the Bullet ſtill miſſes the mark, placed at the mouth of the Gun, on the ſame ſide that the recoil is made.*

Secondly, That about twelve grains of Powder ſhoots wideſt from the mark at all diſtances above mentioned, on the ſame ſide that the Recoil is made.

Thirdly, That above forty eight grains of Powder ſhoots wide from the mark, placed at nine foot from the muzzle of the Peece, on the contrary ſide to that on which the recoil is made.

The cauſe of the firſt I cannot doubt to be the recoil of the Peece (from the force of the Powder) before the Bullet be parted from it.

The ſecond is, as I conceive, becauſe with leſs than twelve grains the Peece ceaſeth to recoil before the Bullet be parted from it. And with more than twelve grains the Bullet is parted from the Peece before it hath recoiled ſo far: A greater power not moving a greater weight ſwifter (horizontally) in the ſame proportion that it doth the leſſer.

And for the third I have this to offer, viz *Becauſe the mouth of the Gun is moving ſidewards whilſt the Bullet is going out; Therefore the mouth of the Peece muſt be contiguous (at leaſt) unto the Bullet on the contrary ſide to that on which the Peece recoils, ſome time after the ſeparation made on the other ſide, and therefore the laſt impulſe of the Bullet from the force of the Powder is on that ſide the Peece recoils, wherefore the Bullet muſt neceſſarily croſs the Axis of the Peece, and that with a greater or leſſer Angle, according to the force of the Powder, & when this Angle therefore is greater than the Angle of recoil, then muſt the Axis of that Cylinder in which*

the

the Bullet moves croſs the Axis of the mark, beyond which interjection the mark being placed, the Bullet muſt be carried neceſſarily wide of the mark on the contrary ſide to the recoil of the Peece.

Fig. 2.

Let a d = a.
and d c = r.
and therefore a b = $r - \sqrt{r^2 - a^2}$
Therefore a b. a d :: $r - \sqrt{r^2 - a^2}$: a :: 1. x (x *being any given quantity.*)
Wherefore $a = xr - x\sqrt{r^2 - a^2}$:
and $x\sqrt{r^2 - a^2} = xr - a$.
Therefore $a^2r^2 - x^2a^2 = x^2r^2 - 2xra + a^2$.
therefore $2xra = x^2a^2 + a^2$.
therefore $\frac{2xr}{x^2 + 1} = a$
Quod &c.

f e k = f l p = p h m = *the Angle of Recoile* p h n *the Angle of Reflexion made at the parting of the Bullet from the Peece. When* p h n > p h m (m h *being alwayes parallel to* f g) *then muſt* h n *enterſect* f g *if continued.*

Some other Experiments I have alſo made with another Peece (about the ſame length, but of a bore neer two tenths of an inch leſs) and ordered in the ſame manner, and do find, that with a ſmall charge the Bullet is ſhot (thence too) wide of the mark on the ſame ſide on which the Recoil is made, and with a full charge wide the contrary ſide.

I cauſed beſides two Piſtol barrels of about five inches Fig. 3.
long to be placed upon Carriages with four Wheels, and loaded with lead, that they might not overturn when diſcharged, and both of equal weight, and an Iron Cylinder *of the length of both their bores, and of the ſame diameter with a piece of Lead of weight equal to it. So that the piece of Lead affixed to either of theſe Guns (which of them I ſhould pleaſe to charge) might equally poiſe the other with the Iron* Cylinder. *And thus indifferently charging either with eight grains more or leſs of Powder, and putting the Iron* Cylinder *home into both, the piece of Lead being affixed to that which held the Powder, and then both ſo ſet upon the floor and the Powder fired, I could not thereby diſcover, that the charged Peece, or the other, either of them, did certainly recoil more or leſs than the other, they rather ſeemed ſtill to be equal.*

Theſe few Experiments I have made ſince, the Barrel being firſt cut at the muzzle, parallel to a vertical plain paſſing the line CD.

B	48	0. 8	L	R	48	1. 2	L
R	48	0 9	L	L	48	3. 2	L
B	16	0. 1	R	L	48	0. 3	L
B	8	0. 2	R				
B	8	0. 6	N				

Beſides

Beſides theſe, there is another that I ſhall mention, and that is the Experiment it ſelf, or the Double-Bottom'd-Ship, invented by Sir *William Petty*: of this I will venture to add a few words, and I think I may do it, without tranſgreſſing that Rule I had fix'd to my ſelf, of not enlarging on the praiſe of particular Names, or Deſigns. For ſince the *Experiment* it ſelf is loſt, I hope I may ſecurely ſpeak of its advantages: ſeeing men are wont out of common humanity to allow the commendations of dead Men, I truſt I may commend a *wreck'd Ship*, without any fear of the envy that may thence ariſe to the *Author*. In brief therefore I will ſay this of it, that it was the moſt conſiderable *Experiment*, that has been made in this *Age* of *Experiments*: if either we regard the great charge of the work, or the wonderful change it was likely to make in *Navigation*, or the great ſucceſs, to which this firſt *Attempt* was arriv'd. Though it was at firſt confronted with the doubts, and Objections of moſt *Seamen* of our *Nation*, yet it ſoon confuted them by *Experience*. It appear'd very much to excel all other forms of *Ships*, in ſayling, in carriage, in ſecurity, and many other ſuch benefits. Its firſt *Voyage* it perform'd with admirable *ſwiftneſs*. And though it miſcarried after its return, yet it was deſtroyed by a common fate, and by ſuch a dreadful *tempeſt*, as overwhelm'd a great *Fleet* the ſame night: ſo that the Antient Fabricks of *Ships* have no reaſon to triumph over that new *Model*, when of threeſcore and ten ſail that were in the ſame *Storm*, there was not one eſcap'd to bring the News.

In a word, though this *Invention* ſucceeded not, while it was only ſupported by *private Purſes*: it will undoubtedly produce great effects, if ever it ſhall be

be retreiv'd upon the *publick Stock* of a *Nation*: which will be able to ſuſtain the firſt hazards, and loſſes that muſt be allow'd to happen in the beginnings of all extraordinary *Trials*.

To their *Experiments* I will ſubjoin their *Obſervations*; which differ but in name from the other, the ſame fidelity, and truth being regarded in collecting them both. §. XXXIV. *Their Obſervations.*

Obſervations of the *fix'd Stars* for the perfecting of *Aſtronomy*, by the help of *Teleſcopes*: of the *Comets* in 1665, and 1666. which were made both in *London*, and elſewhere; and particularly of the firſt *Comet*, for above a month after, it diſappear'd to the naked eye, and became Stationary, and Retrograde.

Obſervations about *Saturn*, of the proportion, and poſition of its *Ring*, of the Motion and Orbit of its *Lunale*, of the ſhadow of the *Ring* on the *Body*, and of the *Body* on the *Ring*; and of its *Phaſes*, *&c.* of *Jupiters Belts*, and of its ſpots, and verticity about its *Axis*, of its eclipſing its *Satellites*, and being eclips'd by them; of the Orbs, Inclinations, Motions, *&c.* of the *Satellites*, together with *Tables*, and *Ephemerides* of their motions.

Obſervations of the Spots about the Body of *Mars*, and of its whirling motion about its Center: of ſeveral Eclipſes of the *Sun*, and *Moon*, and ſome of them as were not taken notice of, by *Aſtronomers*, or Tables commonly us'd: of the Spots in the *Moon*, and of the ſeveral appearances in the Phaſes of it: of the *Moon* at the ſame time, by *Correſpondents* in ſeveral parts of the World, towards the finding her Parallax, and diſtance.

Obſervations of the Eliptical and waved Figures

of the *Planetary Bodies*, neer the *Horizon* from the refraction of the *Hemiſphere*: of the effects of *Lightning*: of the various preſſure of the *Atmoſphere*, by a *Wheel-barometer* for ſeveral years, and of its uſefulneſs for predicting the changes of Weather.

Obſervations on frozen *Beer*: on the Figures of *Snow*, frozen *Water*, *Urine* congeal'd: on the ſuſpenſion of *Mercury* at a great height: on *Mines*, and *Minerals*: on the Concretions of *Wood*, *Plants*, *Shells*, and ſeveral *Animal* Subſtances: on the effects of Earthquakes, Fiery Eruptions, and Inundations: on Lakes, Mountains, Damps, ſubterraneous Fires: on Tides, Currents, and the Depth of the Sea.

Obſervations of the liming of *Ground*, for improvement of the Bodies of *Sheep*, but ſpoiling their Wool: of ſeveral wayes for preventing ſmutty *Corn*: of the importance of changing *Seed-corn*: of the alteration of the Horns of *Sheep*, and other *Cattel*, by the change of Paſture: of the Pores and Valies in *Wood*: the Anatomy of *Trees*: of the ſenſitive, and humble *Plant*.

Obſervations on the *Bills* of *Mortality*: on the leaves of *Sage*: on ſmall living *Flies* in the Powder of *Cantharides*: of Inſects bred in *Dew*: of *Virginian* Silk-Bottoms: of the Parts, and Anatomy of *Fiſhes*: of the Teeth of *Lupus Marinus*, that they are the ſame thing with the *Toad-ſtones* ſet in *Rings*: of the Reſpiration of *Fiſhes*: of *Bernacles*: of the calcin'd Powder of *Toads*: of an Outlandiſh *Deer-skin*, and hair: of the Parts of *Vipers*: of Stones taken out of the Heart of a *Man*: of young *Vipers*, that they do not eat holes through their old ones Bellies, as is commonly affirm'd.

For *Examples* of this *Head*, I will only refer my Reader

Reader to thoſe which Mr. *Graunt* has publiſh'd on the *Bills of Mortality*; wherein the *Author* has ſhewn, that the meaneſt and moſt trivial matters may be ſo cultivated, as to bear excellent Fruit, when they come under the management of an accurate, and prudent *Obſerver*: For from thoſe *Papers*, which went about ſo many years, through every Tradeſmans hands, without any manner of profit, except only to the Clerks that collected them, he has deduc'd many true Concluſions, concerning the graveſt, and moſt weighty Parts of *Civil Government*, and *humane Nature*.

§. XXXV. *An Objection anſwered concerning the uncertainty of Experiments.*

As I am now paſſing away from their *Experiments* and *Obſervations*, which have been their proper, and principal work: there comes before me an *Objection*, which is the more to be regarded, becauſe it is rais'd by the *Experimenters* themſelves. For it is their common complaint, that there is a great *nicety*, and *contingency*, in the making of many *Experiments*: that their ſucceſs is very often various, and inconſtant, not only in the hands of *different*, but even of the ſame *Triers*. From hence they ſuggeſt their fears, that this continuance of *Experimenters*, of which we talk ſo much, will not prove ſo advantageous; though they ſhall be all equally cautious in *obſerving*, and faithful in recording their *Diſcoveries*: becauſe it is probable, that the *Trials* of Future Ages will not agree with thoſe of the preſent, but frequently thwart, and contradict them.

The *Objection* is ſtrong, and material; and I am ſo far from diminiſhing the weight of it, that I am rather willing to add more to it. I confeſs many *Experiments* are obnoxious to failing; either by reaſon of

ſome *circumſtances*, which are ſcarce diſcernable, till the work be over: or from the diverſity of *Materials*, whereof ſome may be *genuine*, ſome *ſophiſticated*, ſome *ſimple*, ſome *mix'd*, ſome *freſh*, ſome may have loſt their *virtue*. And this is chiefly remarkable, in *Chymical Operations*, wherein if the diſſolvents be ill prepar'd, if the *Spirits* be too much, or too little purify'd, if there be the leaſt alteration, in the degree of *Fire*, the quantity of *Matter*, or by the negligence of thoſe that attend it, the whole courſe will be overthrown, or chang'd from its firſt purpoſe.

But what is now to be concluded from hence? ſhall this *inſtability*, and *Caſualty* of *Experiments*, deter us from labouring in them at all? or ſhould it not rather excite us to be more curious and watchful in their *proceſs*? It is to be allow'd that ſuch *undertakings* are wonderfully hazardous and difficult; why elſe does the *Royal Society* indeavour to preſerve them from degenerating, by ſo many *forewarnings*, and *rules*, and a *Method* ſo ſevere? It is granted, that their *event* is often uncertain, and not anſwerable to our expectations. But that only ought to admoniſh us, of the indiſpenſable neceſſity of a jealous, and exact *Inquiry*. If the uncertainty proceeded from a conſtant irregularity of *Nature*, we had reaſon then to deſpair: but ſeeing it for the moſt part ariſes only from ſome defect or change in our progreſs, we ſhould thence learn, firſt to correct our own miſcarriages, before we ceaſe to hope for the *ſucceſs*.

Let then the *Experiment* be often renew'd. If the ſame kinds, and proportions of *Ingredients* be us'd, and the ſame circumſtances be punctually obſerv'd, the *effect* without all queſtion will be the ſame. If ſome little variation of any of theſe, has made any alteration,

tion, a judicious, and well practis'd *Trier* will ſoon be able to diſcern the *cauſe* of it; and to rectifie it, upon the next repetition. If the difference of *time*, or *place*, or *matter*, or *Inſtruments*, will not ſuffer the product to be juſt the ſame in all points: yet ſomething elſe will reſult, that may prove perhaps as beneficial. If we cannot alwayes arrive at the main end of our *Labours*, ſome leſs unſought *Curioſities* will ariſe. If we cannot obtain that which ſhall be uſeful for practice, there may ſomething appear that may inſtruct.

It is ſtrange that we are not able to inculcate into the minds of many men, the neceſſity of that *diſtinction* of my Lord *Bacons*, that there ought to be *Experiments* of *Light*, as well as of *Fruit*. It is their uſual word, *What ſolid good will come from thence?* They are indeed to be commended for being ſo ſevere *Exactors* of *goodneſs*. And it were to be wiſh'd, that they would not only exerciſe this vigour, about *Experiments*, but on their own *lives*, and *actions*: that they would ſtill queſtion with themſelves, in all that they do; what *ſolid good* will come from thence? But they are to know, that in ſo large, and ſo various an *Art* as this of *Experiments*, there are many degrees of uſefulneſs: ſome may ſerve for real, and plain *benefit*, without much *delight*: ſome for *teaching* without apparent *profit*: ſome for *light* now, and for *uſe* hereafter; ſome only for *ornament*, and *curioſity*. If they will perſiſt in contemning all *Experiments*, exeept thoſe which bring with them immediate *gain*, and a preſent *harveſt*: they may as well cavil at the Providence of God, that he has not made all the ſeaſons of the year, to be times of *mowing*, *reaping*, and *vintage*.

Of

§. XXXVI. *The Inſtruments they have invented.*

Of the variety, and excellence of the *Inſtruments*, with which this Age abounds, for their help in *Philoſophical* matters, I have already diſcourſed in the former Part. I will now go on to mention thoſe new ones, which they themſelves, or ſome of their Members, have either *invented*, or *advanc'd*, for the eaſe, ſtrength, and direction of their *ſenſes*, in the motions of *Nature*, and *Art*: of this kind are theſe that follow.

An *Inſtrument* for finding a ſecond of Time by the Sun: another for finding the Celeſtial Refractions.

Three ſeveral *Quadrants* made after three new contrivances, which though they are not above eighteen Inches in Diameter, and ſo are manageable in any Window, or Turret, are yet far more exact, than the beſt, that have been hitherto us'd, for *Aſtronomical Obſervations*, or taking Angles at Land.

A new *Inſtrument* for taking Angles by reflection; by which means the Eye at the ſame time ſees the two Objects, both as touching in the ſame point, though diſtant almoſt to a Semicircle: which is of great uſe for making exact *Obſervations* at Sea.

A new kind of *Back-ſtaff* for taking the Suns altitude by the Shadow, and Horizon: which is ſo contriv'd, that though the ſhadow be at three foot diſtance, or as much more as is deſir'd, yet there ſhall not be the leaſt *Penumbra*: and the Shadow may be eaſily diſtinguiſh'd to the fourth part of a minute.

A *Hoop* of all the fix'd Stars in the *Zodiac*, for the ſpeedy finding the Poſition of the *Ecliptic*, and for knowing the extent of the *Conſtellations*.

A *Copernican Sphere*, repreſenting the whirling Motion

Motion of the Sun, and the Motion of the ſeveral Planets.

A great many new wayes of making *Inſtruments*, for keeping time very exactly, both with *Pendulums*, and without them: whereby the intervals of time may be meaſur'd both on the *Land*, and *Sea*.

A univerſal *Standard*, or meaſure of *Magnitudes*, by the help of a *Pendulum*, never before attempted.

A new kind of *Pendulum Clock*, wherein the *Pendulum* moves circularly, going with the moſt ſimple, and natural motion, moving very equally, and making no kind of noiſe.

A *Pendulum Clock* ſhewing the æquation of Time.

Three new wayes of *Pendulums* for *Clocks*, and ſeveral wayes of applying the motion of the Watch-work to them.

Several new kinds of *Pendulum Watches* for the Pocket, wherein the motion is regulated, by Springs, or Weights, or Loadſtones, or Flies moving very exactly regular.

Several ſorts of *Inſtruments* for compreſſing, and rarefying the Air: A *Wheel-Barometer*, and other *Inſtruments* for finding the preſſure of the Air, and ſerving to predict the changes of the Weather.

A new kind of *Scales*, for examining the gravity of Bodies in all places: to ſee whether the attraction of the *Earth*, be not greater in ſome parts of the *Earth*, than in others, and whether it do not decreaſe, at farther diſtances from the ſurface of the *Earth*, either upwards into the *Air*, or downwards under the *Earth*.

A very exact pair of *Scales*, for trying a great number of *Magnetical Experiments*.

Several

Several very accurate *Beams*, for trying many *Statical Experiments*, and for finding the moſt exact gravity of ſeveral kinds of Bodies.

A great number of *Magnetical Inſtruments*, for making *Experiments* about *Loadſtones*.

Several new kinds of *Levels* for finding the true Horizon, where, by one of not above a foot length, the Horizontal line may be found, without the error of many ſeconds.

A new kind of *Augar* for boring the ground, and fetching up whatever it meets with in the right order.

A new *Inſtrument* for fetching up any Subſtance from the bottom of the Sea, whether Sand, Shels, Clay, Stones, Minerals, Metals.

A new *Bucket* for examining and fetching up whatever Water is to be found at the bottom of the *Sea*, or at any depth, and for bringing it up without *mixing* with the other Water of the *Sea*, through which it paſſes.

Two new wayes of ſounding the depth of the *Sea* without a Line, for examining the greateſt depth of the *Ocean*, in thoſe parts of it, that are moſt remote from the *Land*.

Several *Inſtruments* for finding the velocity of ſwimming Bodies of ſeveral Figures, and mov'd with divers ſtrengths, and for trying what *Figures* are leaſt apt to be overturn'd, in order to the making a true *Theory*, of the *Forms* of *Ships*, and *Boats* for all uſes.

An *Inſtrument* of great height, with Glaſs-windows on the ſides, to be fill'd with Water, for examining the velocity of Bodies of ſeveral Subſtances, Figures and Magnitudes, by their deſcent.

An

An *Inſtrument* for meaſuring, and dividing the time of their Deſcent, to the accurateneſs of two, or three thirds of time, ſerving alſo for examining the ſwiftneſs of Bodies deſcending through the Air, and of Bodies ſhot by a Gun, or Bow.

A *Bell* for diving under water to a great depth, wherein a man has continued at a conſiderable depth under water, for half an hour, without the leaſt inconvenience.

Another *Inſtrument* for a *Diver*, wherein he may continue long under water, and may walk to and fro, and make uſe of his ſtrength, and limbs, almoſt as freely as in the Air.

A new ſort of *Spectacles*, whereby a *Diver* may ſee any thing diſtinctly under Water.

A new way of conveighing the *Air* under Water, to any Depth, for the uſe of *Divers*.

An *Inſtrument* for meaſuring the ſwiftneſs, and ſtrength of the *Wind*.

An *Inſtrument* for the raiſing a continual ſtream of *Water*, by turning round a moveable valve, within the hollow of a cloſe *Cylindrical* Barrel.

Several kinds of *Thermometers* for diſcovering the heat, and cold of the Air, or any other Liquors: a *Thermometer* for examining all the degrees of heat in Flames, and Fires, made of ſeveral Subſtances; as alſo the degrees of heat requiſite to melt Soder, Lead, Tin, Silver, Braſs, Iron, Copper, Gold.

A *Standard* for Cold ſeveral wayes.

An *Inſtrument* for planting of Corn.

Four ſeveral ſorts of *Hygroſcopes* made with ſeveral Subſtances, for diſcovering the drowth, and moiſture of the Air.

Several kinds of ways to examine the goodneſs, and badneſs of *Waters*.

Several *Engines* for finding, and determining the force of *Gun-powder*, by Weights, Springs, Sliding, *&c.*

An *Inſtrument* for receiving, and preſerving the force of *Gun-powder*, ſo as to make it applicable, for the performing of any motion deſir'd.

Several *Inſtruments* for examining the recoiling, true carriage, and divers other proprieties of Guns.

Several kinds of *Otocouſticons*, or *Inſtruments* to improve the ſenſe of hearing.

Several Models of *Chariots*, and other *Inſtruments*, for Progreſſive Motion.

A *Chariot-way-wiſer*, meaſuring exactly the length of the way of the *Chariot*, or *Coach* to which it is apply'd.

An *Inſtrument* for making Screws with great diſpatch.

A way of preſerving the moſt exact impreſſion of a *Seal*, *Medal*, *Sculpture*; and that in a Metal harder than Silver.

An *Inſtrument* for grinding *Optick-glaſſes*: a double *Teleſcope*: ſeveral excellent *Teleſcopes* of divers lengths, of ſix, twelve, twenty eight, thirty ſix, ſixty foot long, with a convenient *Apparatus* for the managing of them: and ſeveral contrivances in them for meaſuring the Diameters, and parts of the *Planets*, and for finding the true poſition, and diſtance of the ſmall fix'd *Stars*, and *Satellites*.

Towards the exactneſs of all manner of theſe *Optick-glaſſes*, the *Engliſh* have got a great advantage of late years, by the *Art* of making *Glaſs*, finer, and more ſerviceable for *Microſcopes*, and *Teleſcopes*, than that of *Venice*. This Invention was brought into our Coun-

try

try, and practis'd here, by the care, and expence of the Duke of *Buckingham*; whom the Author of these Papers ought to mention with all honour; both for his Skill and Zeal in advancing such *Experimental Studies* of which I am writing: and also because it has been by the favour of so great a *Patron*, that I have injoy'd the leisure, and convenience of composing this *History*.

§. XXXVII. *Their Repository and Library.*

As soon as they were reduc'd into a *Fix'd Assembly*, one of the Principal Intentions they propos'd to accomplish, was a General Collection of all the Effects of *Arts*, and the Common, or Monstrous *Works* of *Nature*. This they at first began by the casual *Presents*, which either *Strangers*, or any of their own *Members* bestow'd upon them. And in short time it has increas'd so fast, by a contribution from all Parts, and chiefly by the bounty of Mr. *Colwal*, that they have already drawn together into one Room, the greatest part of all the several kinds of things, that are scatter'd throughout the *Universe*. The Keeping, and Ranging of these into order, is committed to Mr. *Hook*, who had also the honour of being made the first *Curator* of the *Royal Society* by election. This *Repository* he has begun to reduce under its several heads, according to the exact Method of the Ranks of all the *Species* of *Nature*, which has been compos'd by Doctor *Wilkins*, and will shortly be publish'd in his *Universal Language*: A Work wherein this excellent Man has undertaken a Design, that very well fits the temper of his own Mind; for it well became him to teach a *Communion* of Speech amongst all *Philosophers*; whose chief study it has alwayes been, to promote a general agreement, and

correſpondence amongſt all Virtuous and Wiſe men.

This *Book* had ſooner ſeen the light, if part of it had not periſh'd in the *Fire*. Of its uſe and accurate compoſition there is no man can doubt, that has ever heard the name of the *Author*: of whom, if I had not at firſt reſtrain'd my ſelf from particular commendations, I might have ſaid very much in his praiſe, which deſerves to be known to all the World, and to be the firſt *Experiment* of his own *Univerſal Language*.

Their Library.

Having well ſucceeded in this their purpoſe of *collecting* divers patterns of all *Natural*, and *Artificial* things: they have alſo (amongſt others) appointed a *Committee*, whoſe chief employment ſhall be to read over whatever *Books* have been written on ſuch ſubjects. By this means they hope ſpeedily to obſerve, and digeſt into *Manuſcript volumes*, all that has been hitherto try'd, or propounded in ſuch ſtudies. This is the only help that an *Experimenter* can receive from *Books*: which he may ſtill uſe, as his *Guides*, though not as his *Maſters*. For this end they have begun a *Library* conſiſting only of ſuch *Authors*, as may be ſerviceable to their *Deſign*. To this there has been lately made a great Addition, by the Munificent Gift of Mr. *Henry Howard* of *Norfolk*, who has beſtow'd on the *Society* the whole *Arundelian Library*, containing ſeveral hundreds of choice *Manuſcripts*, beſides ſome thouſands of other *Books* of all kinds. And becauſe many of them belong'd to other *Profeſſions*, this Noble Benefactor has given them with a free permiſſion of changing them for others, that ſhall be more proper for their *Work*: Whereby they will ſhortly be able to ſhew a compleat *Collection* of all that has been publiſh'd

publiſh'd in the Antient, or Modern Tongues, which either regards the productions of *Nature*, or the effects of all *Manual Arts*.

Nor is this the only bounty which this Illuſtrious *Perſon* has conferr'd on the *Royal Society*; ſince by the firing of *London*, the firſt place of their meeting has been reſtor'd to its original uſe, and made an *Exchange*, he has afforded them a retreat in his own houſe, where they aſſemble at this preſent: By which favour he has added a new honour to the antient *Nobility* of his *Race*: one of his *Anceſtors* had before adorn'd that place with many of the beſt Monuments of *Antiquity*: And now by entertaining theſe new diſcoveries under his Roof, his *Family* deſerves the double praiſe of having cheriſh'd both the old, and new *Learning*; ſo that now methinks in *Arundel* houſe, there is a perfect repreſentation, what the Real *Philoſophy* ought to be: As there we behold new *Inventions* to flouriſh amongſt the *Marbles*, and *Images* of the *Dead*: ſo the preſent *Arts*, that are now riſing, ſhould not aim at the deſtruction of thoſe that are paſt, but be content to thrive in their company.

Sect. XXXVII. *Their Diſcourſes and Theories.*

It will not I hope be expected, that I ſhould preſent my *Reader* an *Index* of all the ſeveral *Writings*, which have at any time been publiſh'd by the *Members* of the *Royal Society*. I ſhall omit thoſe, which either were printed before the beginning of this *Inſtitution*, or which treat of matters, that have no relation to their *Deſign*. Only I will ſay in general, that there is ſcarce any *Art*, or *Argument*, which has ever been the ſubject of humane *Wit*, of which I might not produce Inſtances, that ſome *Fellows* of this *Society* have given good proofs of their labours in it: of thoſe *Diſcourſes*,

ſes, which have been ſince compos'd by ſome of their *Body*, or read before their weekly *Aſſemblies*, and directly concern the advancement of their *Work*, theſe are the principal.

Several *Hypotheſes* explaining the divers *Phaſes* and *Motions*, and other *Phænomena* of the *Comets*.

Several *Hypotheſes* of *Saturn*, and its *Satelles*.

An *Hypotheſis* of the cauſe of the *Rugoſity* of the *Moons* ſurface.

An *Hypotheſis* of the motion of the *Moon*, and of the *Sea* depending upon it.

An *Hypotheſis* of the Motion of the *Planets*, and of Circular *Motion* in general.

Several *Hypotheſes* for the *Æquation* of Time.

A *Diſcourſe* about the poſſibility of the Retardation of *Cœleſtial Motions*, and of their going ſlower, and ſlower, the longer they laſt.

A *Diſcourſe* of making the ſeveral *Vibrations* of a *Pendulum æqual*, by making the weight of it move in a *Cycloid* inſtead of a *Circle*.

Several *Diſcourſes*, and *Hypotheſes* about the length of a *Pendulum*, for moving once in a ſecond of Time.

A *Diſcourſe* of the moſt convenient length of a *Pendulum*, for making a Standard for a univerſal Meaſure.

Several *Aſtronomical Diſcourſes* of Mr. *Horrex* retriv'd, and digeſted for the Preſs.

Ulegh Beg tranſlated, about the places of the fix'd Stars, and ſeveral other Aſtronomical *Obſervations*.

A *Diſcourſe* about the poſſibility of the change of the attractive power of the *Earth*, and conſequently of the variation of the vibrative motion of *Pendulums*.

A *Diſcourſe* about ſhort inclining *Pendulums*, and of other *Pendulums* counterpois'd above the Center of *Motion*,

Motion, and of others lying *Horizontal* in the manner of a Beam.

An *Hypotheſis* about *Fire*, and *Flame*.

An *Hypotheſis*, and diſcourſe of the gravity, preſſure, and ſpring of the *Air*.

A *Diſcourſe* of an *Air Regiſter*.

Several *Diſcourſes* Mathematical, and Philoſophical, upon the *Experiment* of raiſing great weights by the *Breath*.

A *Diſcourſe* and Demonſtration againſt a propos'd Method of doubling the *Cube*, and of finding two mean *Proportionals*.

Several *Diſcourſes* about *Thermometers*, *Hygroſcopes*, *Baroſcopes*, and other *Weather-wiſers*.

An *Hypotheſis* and *Diſcourſe* of the *Inflection* and inflective veins of the *Air*, and of the fitneſs, and unfitneſs of the *Air* for *Cæleſtial Obſervations*.

An *Hypotheſis* of the Form, and Spring of the *Air*.

A *Diſcourſe* of the different parts of the ſame Water, and of the difference of Waters.

A *Diſcourſe* and *Hypotheſis* of Filtration, and of the Congruity, and Incongruity of *Bodies*.

A *Diſcourſe* of the poſſible height of the *Air*, and of its proportionable rarefaction upwards.

An *Hypothetical Diſcourſe* about the ſuſpenſion of the Clouds, and their preſſure.

An *Hypotheſis*, and *Diſcourſe* of *Earthquakes*.

A *Diſcourſe* of Petrifactions, and an *Hypotheſis* for explaining the ſeveral varieties of ſuch Bodies.

Several *Diſcourſes* about the *Loadſtone*, and an *Hypotheſis* for ſalving its appearances.

A *Diſcourſe* about the Pores of Stones.

A *Diſcourſe* about Eggs.

A *Diſcourſe* concerning the Glaſs-drops.

A *Diſcourſe* and *Hypotheſis* of annealing, and tempering Steel.

Diſcourſes about Cyder, and Coffee.

A *Diſcourſe* of the original of Forms.

An *Hypotheſis* of Light.

A *Diſcourſe* and *Hypotheſis* of the Nature and Proprieties of Colours.

A *Diſcourſe* about improving Wood for Dying, and for fixing Colours.

A *Diſcourſe* about the improvement of Muſick.

A *Diſcourſe* of the differing Heat of Summer, and Winter.

A *Diſcourſe*, and *Hypotheſis* about Fluidity.

Diſcourſes upon ſeveral *Mercurial Experiments*.

Diſcourſes of *Hydroſtaticks*.

Diſcourſes about the force of falling Bodies.

A *Treatiſe* of the motion of the Muſcles.

A *Diſcourſe* of the uſefulneſs of Experimental Philoſophy.

A *Treatiſe* of the vanity of Dogmatizing.

The Sceptical Chymiſt.

Eſſayes about Salt-peter.

The *Parallel* of the Antient, and Modern Architecture.

Microſcopical Obſervations.

Micrographia, or a *Diſcourſe* of things diſcover'd by a *Microſcope*.

Three *Books* of *Feavors*, of the Brain, and of the Scurvy, which I will alledge as the great Inſtances of this head: Wherein the Famous *Author* has with accurate diligence made prodigious improvements in all the parts of Phyſick, and ſhewn that the largeneſs of his *Knowledge* in it, is equal to the happy ſucceſs of his *practice*.

In

In this Collection of their *Diſcourſes*, and *Treatiſes*, my Reader beholding ſo many to paſs under the name of *Hypotheſes*, may perhaps imagine that this conſiſts not ſo well with their Method, and with the main purpoſe of their *Studies*, which I have often repeated to be chiefly bent upon the *Operative*, rather than the *Theoretical Philoſophy*. But I hope he will be ſatisfied, if he ſhall remember, that I have already remov'd this doubt, by affirming, that whatever *Principles*, and *Speculations* they now raiſe from things, they do not rely upon them as the abſolute end, but only uſe them as a means of farther *Knowledge*. This way the moſt ſpeculative *Notions*, and *Theorems* that can be drawn from matter, may conduce to much profit. The light of *Science*, and *Doctrines* of cauſes, may ſerve exceeding well to promote our *Experimenting*; but they would rather obſcure, than illuminate the mind, if we ſhould only make them the perpetual Objects of our *Contemplation*: as we ſee the light of the Sun, is moſt beneficial to direct our footſteps in walking, and our hands in working, which would certainly make us blind, if we ſhould only continue fix'd, and gazing on its Beams.

§. XXXIX. *The Hiſtories they have collected.*

The *Hiſtories* they have gather'd are either of *Nature*, *Arts*, or *Works*. Theſe they have begun to collect by the plaineſt Method, and from the plaineſt Information. They have fetch'd their Intelligence from the conſtant and unerring uſe of *experienc'd Men* of the moſt unaffected, and moſt unartificial kinds of life. They have already perform'd much in this way, and more they can promiſe the world to accompliſh in a very ſhort ſpace of Time.

There are already brought in to them the *Hiſtory*

of *Comets* in general, and eſpecially of the two laſt: The Hiſtory of *Engliſh Mines*, and *Oars*: and particularly two ſeveral *Hiſtories* of *Tinneries* and *Tin-working*.

The *Hiſtories* of *Iron-making*: of *Lignum Foſſile*: of *Saffron*: of *Alkermes*: of *Verdigreace*: of *whiting* of *Wax*: of *Cold*: of *Colours*: of *Fluidity*, and *firmneſs*.

The *Hiſtories* of Refining: of making Copperas: of making Allum: of Salt-peter: of making Latten: of Lead: of making Salt out of Sea-water: of refining Gold: of making Pot-Aſhes: of making Ceruſe: of making Braſs: of Painting, and Limning: of Calcography: of Enamelling: of Varniſhing: of Dying.

The *Hiſtories* of making Cloth: of Worſted-Combers: of Fullers: of Tanners, and Leather-making: of Glovers, and Leather-dreſſing: of Parchment, and Vellum-making, and the way of making tranſparent Parchment: of Paper-making: of Hatters: of making Marble-paper: of the Rowling-Preſs.

The *Hiſtories* of making Bread: of Malt: of brewing Beer and Ale in ſeveral places: of Whale-fiſhing: of the Weather for ſeveral years: of Wind-mills, and other Mills in *Holland*: of Maſonry: of Pitch and Tar: of Maiz: of Vintners: of Shot: of making Gun-powder: and of making ſome, that is twenty times as ſtrong as the common Piſtol-powder.

The two laſt of theſe were communicated to the *Royal Society* by the favour of *Prince Rupert*; whom I take the boldneſs to mention here, for his excellent Knowledge, and uſe in all manner of Mechanical Operations.

Operations. But his name will be recorded in all the *Hiſtories* of this time, for greater works, for many glorious Enterpriſes by Sea and Land, and for the Immortal Benefits whereby he has oblig'd the *Engliſh Nation.*

The Inſtances that I ſhall give of this their manner of collecting *Hiſtories*, ſhall be, of *Works*, that of *Salt-peter*, of *Arts*, that of *Dying*, of *Nature*, that of *Oyſters*: which laſt may perhaps ſeem a ſubject too mean to be particularly alledg'd; but to me it appears worthy to be produc'd. For though the *Britiſh Oyſters* have been famous in the World, ever ſince this Iſland was diſcover'd, yet the ſkill how to order them aright, has been ſo little conſider'd amongſt our ſelves, that we ſee at this day, it is confin'd to ſome few narrow *Creeks* of one ſingle County.

THE HISTORY Of the Making of SALT-PETER

By Mr. *HENSHAW.*

"WHether the *Nitre* of the Antients be of the "ſame ſpecies with the Salt which is com- "monly known by the name of *Salt peter*, is variouſ- "ly diſputed by very learned Authors amongſt the "modern Phyſitians: on the negative ſide are *Ma- "thiolus* and *Bellonius*; the latter of which had the "advantage, by the opportunity of his travels in *E- "gypt*, to have often ſeen and handled them both, and "is ſo poſitive as to pronounce, that in all *Chriſten- "dom* there is not one grain of *Nitre* to be found, un- "leſs it be brought from other parts, although at the "time of his being in *Grand Caire* (which was about "the year 1550.) it was ſo common there (as he "ſayes) that ten pounds of it would not coſt a "*Moidin.* Among thoſe that hold the affirmative, "the moſt eminent are *Cardan* and *Longius*; and it "ſhould ſeem the general vote of Learned men hath "been moſt favourable to that Opinion, by reaſon "that in all Latine Relations and Preſcriptions, the "word *Nitrum* or *Halinitrum* is moſt commonly uſed "for *Salt-peter.*

"I

"I have often enquired amongſt our *London* "Drugſters for *Egyptian Nitre*, and if I had been ſo "fortunate as to have found any, I doubt not but I "ſhould have been able to have put an end to that "Queſtion by a Demonſtration; that is, by turning "the greateſt part of it into *Salt-peter*. However, "the Obſervations I have made in my own private "Experiments, and in the practice of *Salt-peter-men* "and Refiners of *Salt-peter*, ſeem to give me ſuffici- "ent ground to ſuſpect, that the confidence of thoſe, "who hold them to be ſeveral Salts, proceedeth "chiefly from their being unacquainted with the "various Φαινόμενα of *Salt-peter* in the making and re- "fining of it: and alſo their comparing double re- "fined *Salt-peter* (of which Gunpowder is made) "with that deſcription of *Nitrum* and *Aphronitrum* "in the tenth chapter of the one and thirtieth Book "of *Pliniès Natural Hiſtory* (the only tolerable ac- "compt of that Salt that hath been handed to us "from Antiquity) where he tells us, That *Aphroni-* "*trum* was *Colore penè purpureo*, and *Egyptian Nitre* "*Fuſcum & Lapidoſum*, adding afterward, *Sunt ibi* "*Nitrariæ in quibus rufum exit a colore terræ*, which "is ſufficient to have hinted to any one but mode- "rately verſed in the modern way of ordering *Salt-* "*peter*, that the Antients were not at all ſkilled in re- "fining their *Nitre* from the Earth and common Salt "that is uſually mingled with it, nor from that foul "yellow Oyl, which, it ſeems, did accompany their "*Nitre*, as well as it doth our *Salt-peter*, in great a- "bundance; for *Pliny* takes notice of it, when he "mentions the removing the *Nitre* (after it is grain- "ed) out of the *Nitrariæ*, ſaying, *Hic quoque natura* "*ſui intervenit, ad ſcabiem animalium utilis*: And

"indeed

"indeed this greaſie Oyl (which the Workmen call "*Mother of Salt-peter*, and perhaps is but the crude "and unripe part of it) doth by nature ſo wonder- "fully adhere to every part elſe of the *Peter* (it "may be ordained for the nutriment and augmenta- "tion of it) that the ſeparation of it is the ſole cauſe "of the great charge and labour that is required to "the refining of *Peter*: otherwiſe the *Peter* will be "yellow, or brown, or ſome other dark colour. And "*Scaliger* in his 104. *Exercit. ſect.* 15. ſaith, *Sublu- "ſtris purpuræ quaſi ſplendor quidam in ſalis-petræ-ter- "ris ſepenumero eſt a nobis obſervatus*; and he that "ſhall boyl a Lixivium paſt through a *Salt-peter* "earth, up to a conſiſtence, without filtring it "through aſhes, or giving the Salt leave to Chryſtal- "lize, may perhaps find ſomething not unlike the *Ni- "tre* of the Antients.

"To make this doubt yet clearer, it will require "your patience to obſerve a few ſhort remains out of "the ſame *Pliny*, concerning the production of *Nitre*; "ſaith he, *Exiguum Nitri fit apud Medos, candeſcenti- "bus ſiccitate convallibus quod vocant Halmirhaga: "minus etiam in Thracia juxta Philippos ſordidum "Terra quod appellant Agrium.*

"This agrees very exactly with what I have been "informed of by a Refiner of *Salt-peter*, that near "*Sophia*, *Santa-Cruz*, and ſeveral other places in *Bar- "bary*, he hath ſeen *Salt-peter* ſhoot out of the ground "(as thick and white as a hoar froſt) on many bar- "ren and deſart Lands; only he adds, that this hap- "pens not till the beginning of the rains in *Auguſt*, or "*September*; and that it is the falling of the freſh- "water that cauſes the *Salt-peter* to ſhoot out into "little Chryſtals; and that the people of the Coun-

"try

"try do no more but take it off the ground as clean "as they can, and ſell it to Merchant-Strangers. This "is, ſayes he, the *Barbary Peter*, which the Refiners "buy commonly at twenty ſhillings *per Cent*.

"Much after the ſame manner (by the relation of "an *India* Merchant) is that great quantity of *Pe-* "*ter* produced, which of late years hath been "brought into *England*, and other parts of *Chriſten-* "*dom*, from about *Pegu* in *Eaſt-India*, ſaving that the "Natives do refine it once, before they ſell it to the "Merchants: But being not ſo ſkilful, to diſcharge "it from the common Salt, which attends *Peter*, our "Workmen do refine it again, before it be fit for "Gun-powder.

"The next remarque out of *Pliny* is, *Aquæ vero* "*Nitroſæ pluribus in locis reperiuntur, ſed ſine viribus* "*Denſandi* (he means by the heat of the Sun in thoſe "places) *Optimum Copioſumque in Clytis Macedoniæ* "*quod vocant Chalaſtricum candidum purumque proxi-* "*mum ſali. Lacus eſt Nitroſus, exiliente è medio dulci* "*fonticulo, ibi fit Nitrum circa Canis ortum, novenis* "*diebus, totidemque ceſſat, & rurſus innatat. & deinde* "*ceſſat, iis autem diebus quibus gignitur ſi fuere imbres* "*ſalſius Nitrum faciunt, Aquilones deterius quia Vali-* "*dius commovent limum. In Egypto autem confici-* "*tur multò abundantius ſed deterius, nam fuſcum lapi-* "*doſumque eſt, fit penè eodem modo quo Sal: niſi* "*quod Salinis mare infundunt, Nilum autem Ni-* "*trariis.*

"How ſuch great plenty of *Nitre* ſhould be found "in the Waters above mention'd will be no difficulty "to conjecture, if we conſider that Lakes are the re-"ceptacles of Land floods, and that great Rains may "eaſily bring it to the Lake in *Macedonia*, from the

"higher

"higher parts in the Country about it. And for the "River *Nile*, there muſt needs be leſs ſcruple con- "cerning it, if we call to mind that once in a year it "ſweeps with an impetuous overflow the burnt and "barren Deſarts of *Africa* under the *Torrid Zone*; "where, by the relation of Travellers, thoſe Sands "are viſibly full of *Nitre*, and thoſe few Springs and "Wells that are to be found there, are by that rea- "ſon ſo bitter, that the *Mores* and their Camels are "forced to make a hard ſhift with them in their long "journeys.

"But when he comes to deſcribe the *Aphronitrum*, "he comes more home, both to the name and nature "of our *Salt-peter*, in theſe words, *Proxima ætas Me- "dicorum tradidit, Aphronitrum in Aſia Colligi in "ſpeluncis & molibus diſtillans, dein ſole ſiccant.* And "*Scaliger* ſpeaking of *Salt-peter*, ſayes, *Eſt quædam "Nitri ſpecies inhærens Rupibus, in quibus inſolatur, ac "propterea Salpetra dicitur.* And I my ſelf, for my "own ſatisfaction in the point, have drawn very "good *Rock peter* out of thoſe *Stiriæ*, which are "uſually found hanging like Icycles in Arched-cel- "lars and Vaults; and have been told, that a Phy- "ſitian in *Shropſhire* did perform great Cures by ver- "tue of *Sal-prunellæ*, which he made only of Flower "of Brimſtone and thoſe *Stiriæ*.

"But to ſteer more directly upon our immediate "ſubject, *Salt-peter*; though it be likely, that the Air "is every where full of a volatile kind of *Nitre*, "which is frequently to be ſeen coagulated into fine "white Salt, like Flower of Wheat (but by the ve- "ry taſte may be eaſily known to be *Peter*) ſticking "to the ſides of Plaſtred-walls, and in Brick-walls "to the Mortar between the Bricks, (in dry wea-

"ther,

"ther, or where the wall is defended from the rain)
"for Lime doth ſtrongly attract it; though Dew and
"Rain do conveigh much of it to the Earth, and the
"Clouds ſeem to be ſpread out before the face of the
"Sun, either to imbibe ſome part of his influence, or
"to have a Salt generated in them, for to advance the
"fertility of the Earth, and certainly they return
"not without a bleſſing; for I have more than once
"extracted *Salt peter* out of Rain and Dew, but from
"the latter more plentifully, and yet even there, is
"*Salt-peter* accompanied with a greazy purple Oyl,
"in great plenty: Though (as I have found upon
"tryal) that moſt ſtanding waters, and even deep
"Wells have ſome ſmall quantity of *Salt-peter* in
"them; though the face of the Earth, if it were not
"impregnated with this Salt, could not produce Ve-
"getables; for Salt (as the Lord *Bacon* ſayes) is
"the firſt Rudiment of Life; and *Nitre* is as it were
"the life of Vegetables: Yet to be more ſure of it, I
"made Experiment likewiſe there too, and found
"ſome little of it in fallows, and the Earth which
"Moles caſt up in the Spring: Though I ſay the Air
"and Water want it not, yet is it not there to be had
"in any proportion, anſwerable to the charge in get-
"ting it: And though the Earth muſt neceſſarily
"have great quantities thereof, generated or infuſed
"into it; yet in theſe temperate Countreys of *Eu-
"rope*, it is no ſooner dilated by Rain-water, or the
"Moiſture of the Earth, but it is immediately apply-
"ed to the production or nutriment of ſome Plant,
"Inſect, Stone, or Mineral; ſo that the Artiſt will find
"as little of it here to ſerve his turn, as in the other
"two Elements.

"The only place therefore, where *Salt-peter* is to

"be found in theſe Northern Countries, is in Stables, "Pigeon-houſes, Cellars, Barns, Ware-houſes, or "indeed any place, which is covered from the Rain, "which would diſſolve it, and (as I have ſaid) make "it vegetate; as alſo from the Sun, which doth rarifie "it, and cauſe it to be exhaled into the Air; (For "the ſame reaſon Huſbandmen alſo might make dou-"ble or treble the profit they uſually do of their "Muck, if they would lay it up under a Hovel, or "ſome covered place, until they carry it out upon "their Land.) And I have been told by an experi-"enced Workman, that no place yields *Peter* ſo plen-"tifully, as the Earth in Churches, were it not an im-"piety to diſturb the Aſhes of our Anceſtours, in that "ſacred Depoſitory.

"Provided alwayes, that the Earth be of good "mould, and the better the mould is, the more *Peter* "is produc'd, for in Clay or ſandy Earth, little or none "is to be found: The freer ingreſs the Air hath into "a place, is ſtill of more advantage, ſo that the "Sun be excluded: And let the Earth be never ſo "good, if it be laid on a brick or boarded floor, it will "not be ſo rich in *Peter*, as if it have free communi-"cation with the Exhalations of the lower parts of "the Earth.

"In any place thus qualified, you cannot miſs of "good quantities of *Peter*, if it have not been drawn "out in ſome years before; which a Workman will "quickly find, after he hath digged the firſt ſpadeful "of Earth, by laying a little of it on the end of his "tongue, and if it taſt bitter, he is ſure of good ſtore "of mineral, (as they love to call it) that is, *Salt-peter*; if the Ground be good, it continues rich, to "ſix or eight foot deep, and ſometimes, but not often, "to ten. "After

"After the *Salt-peter* is extracted, if the Earth be "laid wet into the ſame place again, it will be twenty "years ere any conſiderable quantity grow there of "it; but if the Earth be well dryed, it will come in "twelve or fourteen: and if they mingle, with the "dryed Earth ſtore of Pigeons-dung, and mellow "Horſe-dung, and then temper it with Urine (as was "uſual before we were ſupplied with *Peter* from *In-*"*dia*) it will be fit to dig again in five or ſix years: "He that ſhall caſt Water upon a Ground fit to dig "for *Peter*, will only ſink the Mineral deeper into the "Earth; but he that throws Soap-ſuds on it, will "quite deſtroy the *Peter*, (as the Workmen have a "Tradition) and it very well deſerves a further En-"quiry.

"That *Salt-peter*, and the way of drawing it out "of the Earth, now in uſe, was a modern Invention, is "generally concluded by all Authors; but whether "we owe it to chance, or the ſagacity of ſome great "Wit, is as unknown, as the time when it was firſt diſ-"covered.

"It ſeems to have many years preceeded the Inven-"tion of Gunpowder, which by the *Germans* is aſcri-"bed to *Conſtantine Autlitzer*, or *Berthold Schwertz* "a Monk of *Friburgh*, and was, in all probability, not "long diſcovered, when the Inventor (as *Polydore* "*Virgil* tells us) taught the uſe of Guns, to the *Vene-*"*tians*, at the Battel of *Foſſa Claudia*, when they ob-"tain'd that notable Victory over the *Genoueſes*, *An-*"*no* 1380. For there is mention made, both of *Salt-*"*peter* and *Aqua fortis*, in the Writings of *Geber*, a "*Spaniſh More*, and an *Alchymiſt*; but at what time "he lived is unknown, though it be certain, ſome "hundreds of years before *Raimund Lully*; who a-

"bout the year 1333. publiſhed ſome of his Books, "wherein he treats of *Salt-peter* and *Aqua fortis*. "It is no ill conjecture of *Maierus*, that the foreſaid "Monk, being a ſkilful Alchymiſt, had a deſign to "draw a higher Spirit from *Peter* than the common "*Aqua fortis*, and that he might better open the bo- "dy of *Peter*; he ground it with Sulphur and Char- "coal, by which Compoſure he ſoon became the In- "ventour of Gun-powder.

The manner of making

SALT-PETER.

"IN the firſt place you muſt be provided of eight "or ten Tubs, ſo large, that they may be able to "contain about ten Barrows full of Earth, each of "them. Theſe Tubs muſt be all open at the top; "but in the bottom of every one of them, you muſt "make a hole near to that ſide you intend to place "outermoſt, which hole you muſt fit very well with "a Tap and Spigot on the outſide downward. On "the inſide of the Tub, near the tap-hole, you muſt "carefully place a large wad of ſtraw, and upon that "a ſhort piece of board, which is all to keep the earth "from ſtopping up the tap-hole. When you have "placed your Tubs on their ſtands, at ſuch a diſtance "one from the other, that you may come with eaſe "between them, then fill them up with ſuch *Peter-* "*earth* as you have choſen for your work, leaving "only void about a ſpans breadth between the Earth "and the edge of the Tub; then lay on the top of

"the

"the Earth in each Tub, as near as you can to the "middle, a rundle of Wicker, like the bottom of a "Basket, and about a foot in diameter, and by it stick "into the earth a good strong Cudgel, which must "be thrust pretty near the bottom; the Wicker is to "keep the Water, when it is poured on, from hollow-"ing and disordering the Earth, and the Cudgel is "to be stirred about, to give the Water ingress to the "Earth upon occasion: Then pour on your Earth "common cold Water, till it stand a hands breadth "over the Earth: When it hath stood eight or ten "hours loosen the Spigots, and let the Water rather "dribble, than run into half Tubs, which must be set "under the taps: This *Lixivium* the Workmen call "their Raw-liquor; and note that if it come not "clear at the first drawing, you must pour it on again, "and after some little time draw it off, till it come "clear, and of the colour of Urine.

"If you are curious to know how rich your Li-"quor is before boyling, you may take a Glass-vial, "containing a quart, fill it with the common Water "you use, then weigh it exactly; next fill the same "Glass with your Liquor, and find the difference of "weight, which compared with the quantity of all "your Liquors, will give you a very near ghess, how "much *Salt-peter* you are like to make by that boyl-"ing.

"Then pour on again, on the same Earth, more "common Water, that it may bring away what is re-"maining in the Earth of the former Liquor. This "second Liquor is of no other use, but to be "poured on new Earth, instead of common Wa-"ter, because it contains some quantity of *Salt-peter* "in it.

"When

"When this is done, turn out the uſeleſs inſipid "Earth out of the Tubs, which you muſt fill with "new Earth, and continue this Operation, till you "have in the ſame manner lixiviated all the Earth: "Then fill your Copper with your Liquor, which "Copper, for one of the Profeſſion, muſt be about "two hundred weight, and ſet ſtrongly in a Furnace "of brick-work; beſides, on one ſide of your Fur-"nace, you are to place a Tub full of your Liquor, "which at a tap below may dribble as faſt into the "Copper, as the force of the Fire doth waſt your "Liquor, which Invention is only to ſave charges in "Fewel. When you have boyled it up to that height, "that a little of it, ſlirted off the finger on a live "Charcoal, will flaſh like Gun-powder (which for "the moſt part falls out to be after two dayes and a "nights boyling) at what time, upon tryal, a hun-"dred weight of the Liquor contains about five "and thirty pound weight of *Peter*. But the Work-"men ſeldom make uſe of any further indication, "than by finding the Liquor hang like oyl on the "ſides of the Braſen-ſcummer, when 'tis dipped into "it, which is a ſign it is fit to be paſſed through the "Aſhes, which is done in this manner.

"You muſt prepare two Tubs fitted after the man-"ner of the firſt, where you put your Earth, ſaving "that at the bottom of theſe Tubs, you muſt lay "Reeds or Straw a foot high, over them place looſe "boards, pretty neer one another, over them, a little "more Straw (which is to keep the Aſhes from the "top, and to give the Liquor room to drein the bet-"ter from them:) Then fill up your Tubs with "any ſort of Wood-aſhes to half a foot of the top; "Then pour on the foreſaid Liquor, as it comes ſcal-

"ding

" ding hot out of the Copper, on the Aſhes contain-
" ed in the firſt Tub; then after a while draw it off
" at the top; and ſo continue putting on and draw-
" ing off, firſt at one Tub of Aſhes, then at the other,
" till your Liquor grow clear, and loſe the thick tur-
" bid colour it had when it went on.

" When all the Liquour hath in this manner paſt
" through the Aſhes of both Tubs, that by this means
" all its greaſie oyl is left behind in the Aſhes, you
" muſt keep it for the ſecond boyling in a veſſel by it
" ſelf: in the mean time pour upon your Aſhes a ſuffi-
" ent quantity of common Water very hot, once or
" twice, to bring away what is remaining of the Li-
" quor in the Aſhes.

" When you begin the ſecond boyling, put firſt
" into the Copper the Water that went laſt through
" your Aſhes, and as that waſteth, let your ſtrong Li-
" quor drop into the Copper, out of the Tub above
" deſcribed, ſtanding on the ſide of the Furnace, ti'l
" the Liquor in the Copper be ready to ſhoot or
" chryſtalliſe.

" Note that toward the end of your boyling,
" there will ariſe great ſtore of Scum and Froth,
" which muſt be carefully taken off with a great braſs
" Scummer, made like a Ladle, full of little holes, and
" uſually about that time it lets fall ſome common Salt
" to the bottom, which you muſt take up with the
" ſaid Scummer, and lay it aſide for another uſe.

" To know when the Liquor is ready to ſhoot into
" *Peter*, you need but drop a little of it on a knife, or
" any other cold thing that hath a ſmooth ſuperfi-
" cies, and if it coagulate, like a drop of tallow, and
" do not fall off the knife when it is turned down-
" ward, which alſo may be judged by its hanging like

" oyl

"oyl to the ſides of the Scummer. When the Liquor "is brought to this paſs, every hundred weight of it "containeth about threeſcore and ten pound weight "of *Peter*.

"When you find your Liquor thus ready to ſhoot, "you muſt with great Iron Ladles lade it out of the "Copper into a high narrow Tub for that purpoſe, "which the Workmen call their ſettling Tub; and "when the Liquor is grown ſo cool, that you can en-"dure your finger in it, you ſhall find the common or "cubick Salt begin to gravulate and ſtick to the ſides "of the Tub, then at the tap, placed about half a "foot from the bottom, draw off your Liquor into "deep wooden Trays, or Braſs-pans, and the cooler "the place is where you let them ſtand to ſhoot in, "the better and more plentifully will the *Salt-peter*, "be produc'd; but it will be of no good colour till "it be refined, but will be part white, part yellow, "and ſome part of it blackiſh.

"The Salt which ſticketh to the ſides and bottom "of the ſetling Tub is (as I have ſayd) of the na-"ture of common Salt; and there is ſcarce any Peter "to be found but is accompanied with it, though no "doubt ſome of this is drawn out of the Aſhes by the "ſecond Liquors: If it be foul they refine it by it "ſelf, and about *London* ſell it at good rates to thoſe "that ſalt Neats Tongues, Bacon, and Collar-Beef, "for beſides a ſavory taſte, it gives a pleaſing red co-"lour to moſt Fleſh that is ſalted with it. *Pliny* ſayes "*Nitrum obſonia alba & deteriora reddit Olera viri-"diora*, whether Salt-peter doth ſo, I have not yet "tryed.

"When the Liquor hath ſtood two dayes and two "nights in the Pans, that part of the Liquor which is

"not

" not coagulated but ſwims upon the *Peter*, muſt be
" carefully poured off, and being mingled with new
" Liquors muſt again paſs the Aſhes before it be boyl-
" ed, elſe it will grow ſo greaſy it will never generate
" any Salt.

To Refine

SALT-PETER.

" AFter you have made your Copper very clean,
" put in as much Water as you think will diſ-
" ſolve that quantity of *Peter* you purpoſe to Refine,
" when the Water is very hot caſt in the *Peter* by lit-
" tle and little, ſtirring it about with a Ladle, that it
" may the ſooner diſſolve, then increaſe the Fire till
" your Liquor begin to boyle: In the mean time feel
" with the Scummer, whether there be at the bottom
" any Salt undiſſolv'd and take it out, for it is Com-
" mon-Salt, and doth not ſo ſoon diſſolve as the *Peter*;
" then as the Water boyls ſcim of the Froth that ſwims
" at the top of it as faſt as it riſeth; when it hath
" boyled to the height that a drop of it will coagu-
" late on a Plate, (as hath been ſaid above in the ma-
" king of *Salt-Peter*,) then caſt in by degrees either
" a Pint of the ſtrongeſt Wine-Vinegar, or elſe four
" Ounces of Allom beaten to powder (ſome chooſe
" burnt Allom,) and you ſhall obſerve a black Scum
" to riſe on the top of the Liquor, which when you
" have allowed ſome time to thicken, you may eaſily
" take off with the Scummer; repeat this ſo often till
" no more Scum ariſes. Some do uſe to throw in a
" Shovel full of quick-Lime, and ſay it makes *Peter*

" the whiter, and Rock the better; you muſt take " great care all this while the Fire be not too ſtrong, " for while this is doing, the Liquor will be apt to " boyl over, and will not eaſily be appeaſed without " your great loſs.

" When this is done, lade out the Liquor into a " ſetling Tub, and cover it over with a Cloth, that it " cool not too ſoon, and within an hour or two a " thick yellow Fæces will fall to the bottom of the " Tub, then quickly draw off the Liquor while it is " hot, into the ſhooting Trays or Pans, and do as you " did in making *Peter*, ſaving that you muſt cover the " Trays with a Cloth, for then the Liquor will begin " to ſhoot at the bottom, which will make the *Peter-* " *Rock* into much fairer Chryſtals, than otherwiſe it " would: When no more *Peter* will ſhoot (which is " commonly after two days,) pour off the Liquor " that ſwims at the top, and put the *Peter* into a Tub " with a hole at the bottom for to drain, and when " it is dry, it is fit for uſe.

" The Figure of the Chryſtals is Sexangular, and " if it hath rightly ſhot, is fiſtulous and hollow like a " Pipe.

" Before I proceed to tell you, how this darling " of Nature (the very Baſis and Generation of Nu- " triment) is converted into Gun-powder (the moſt " fatal Inſtrument of Death that ever Mankind was " truſted withal) I will crave leave to acquaint you " with a few Speculations I have of this Salt, which " if I could cleerly make out, would lead us into " the knowledge of many noble Secrets in Nature; " as alſo to a great improvement in the Art of ma- " king *Salt-Peter*.

" Firſt then you are to obſerve, that though *Peter*

"go alway in Gun-powder, yet if you fulminate it "in a Crucible, and burn of the volatile part with "Powder of Coal, Brimſtone, Antimony or Meal, "there will remain a Salt, and yet ſo fixed (very "unlike Common-Salt) that it will endure the force "of almoſt the ſtrongeſt Fire you can give it; which "being diſſolved into Water and Spirit of *Nitre* drop-"ped into it, till it give over hiſſing (which is the "ſame with the Volatile part that was ſeperated "from it in the fulmination) it will be again reduced "to Chryſtals of *Peter*, as it was at firſt, which noble "Experiment the World hath already been taught "by an honourable Member of this Society; with a "train of ſuch important Obſervations, as never be-"fore were raiſed from one Experiment.

"That which I aim at then is, that if the Spirit of "the Volatile Salt of Soot, or of the Urine, Blood, "Horns, Hoofs, Hair, Excrements, or indeed any part "of Animals, (for all abound with ſuch a Volatile "Salt fixed, and Oyle as *Peter* doth) could by the "ſame way or any like it, be reduced to *Peter* or "ſome *Nitrous* Salt not much differing from it: It "would excellently make out a Theory that I am "much delighted with, till I am convinced in it; "which is, that the Salt which is found in Vegetables "and Animals, is but the *Nitre* which is ſo univer-"ſally diffuſed through all the Elements, (and muſt "therefore make a chief Ingredient in their Nutri-"triment, and by conſequence of their Generation) "a little altered from its firſt Complexion: And that "the reaſon why Animals that feed on Vegetables "are obliged by Nature, to longer meals than thoſe "that feed on other Animals; is, becauſe Animals "are fuller of that Salt than Vegetables: And in-

"deed ſuch Animals are but Caterers of it for Man;
"and others whom Natures bounty gratifies with a
"more luſty and delicious Dyet.

"I confeſs I have been the more confirmed in this
"fancy, ſince I have often ſeen a Friend of mine,
"with a Natural and Facile Ἐ χειρία, convert the
"greater part of *Peter*, into a Salt ſo like the Vola-
"tile Salt of Urine, that they are Scarce to be diſtin-
"guiſhed by ſmell or taſt, and yet he adds nothing
"to it that can poſſibly be ſuſpected to participate of
"that Nature: But indeed all Volatile Salts are ſo
"alike, that it is not eaſy to diſtinguiſh them in any
"reſpect.

THE

THE HISTORY Of Making GUN-POWDER.

"THE materials of *Gun-Powder* are, *Salt-Peter*, "*Brimſtone*, and *Coal*; the *Peter* and *Brim-* "*ſtone* muſt be both refined if you mean to make "good *Powder*, and the Coal muſt be *Withy* and *Al-* "*der* equal parts; for *Withy* alone is counted too "ſoft, and ſome do commend *Hazle* alone to be as "good as the other two.

"The whole Secret of the Art conſiſts in the pro- "portion of the Materials, the exact mixture of them, "that in every the leaſt part of *Powder* may be found "all the Materials in their juſt proportion; then the "Corning or making of it into Grains; and laſtly the "Drying and Duſting of it.

"The Proportion is very differently ſet down by "ſeveral Authors; *Baptiſta Porta* tells us the ordina- "ry *Powder* is made of Four parts of *Peter*, one of "*Sulphur*, and one of *Withy* Coal: But the beſt *Powder* "of 6, or 8. of *Peter*, and one a piece of the other, "which agrees pretty well with *Bonfadini* a late *Ita-* "*lian* Writer, in his Book of the Art of *Shooting flying*, "where to make the beſt *Gun-Powder* he preſcribes "Seven parts of *Peter*, one of *Brimſtone*, and of *Ha-* "*zle* Coal an ounce leſs in every pound: *Cardan* "ſayes; *Conſtat ex tribus Halinitri partibus, duabus*

"*Salignis*

"*Saligni Carbonis atque una Sulphuris, Convenitque*
"*magnis Machinis: Sed Mediocribus Halinitri partes*
"*decem, Saligni carbonis tres, Sulphuris duas, par-*
"*vis verò Halinitri partes decem; Carbonis ligni nucis*
"*Avellonæ ſine nodis, tum Sulphuris partem unam ſin-*
"*gularem: Langius* appoints three of *Peter*, two of
"*Withy* Coal, and one of *Brimſtone*: The *Engliſh*
"Author of Fire-Works ſayes, that the proportions
"in *England* to make good, indifferent, and ordinary
"*Powder* is, 5.4. and 3. parts of *Peter*, to two of Coal
"and one of *Brimſtone*. Our *Engliſh* Work-men are
"generally ſo curious of their ſecret, that I could not
"obtain the proportion of them without a promiſe of
"Secrecy: But when all is done their ſecret is not ſo
"much the way to make the beſt *Powder*, as the
"beſt way to get moſt mony by it; by ſubſtracting
"from the *Peter*, and making up weight with the
"Coal; when indeed there is ſo great a Latitude,
"that provided the Materials be perfectly mixt, you
"make good *Powder* with any of the proportions a-
"bove mention'd; but the more *Peter* you allow it,
"it will ſtill be the better, till you come to obſerve
"Eight parts.

"The next thing after the proportion, is the mix-
"ture, about which moſt of the workmens time and
"pains is beſtowed: For firſt in a Horſe-mill with
"two ſtones (like that with which they grind their
"Materials at the *Glaſs-houſe*) moving upon a Mar-
"ble bottom, which is edged with boards ſet ſloap-
"ing, that what ſlips from under the ſtones may ſlide
"back again.

"They grind the Brimſtone and Coal each of them
"apart by themſelves as fine as poſſibly they can;
"then they ſift each of them apart by themſelves:

"The

"The Brimſtone is ſifted thorow Tiffany in a Bolt-
"ing-mill, ſuch as the Bakers uſe for wheat-flower:
"The Coal is ſifted thorow Lockram, in a bag made
"like a ſhirt ſleeve; for the convenience of the
"Work-man it is done in a cloſe Bin, with only two
"holes for him to put his arms in and ſhake the bag
"about. Whatſoever of each material is not ſmall
"enough to ſift thorow, is brought again to the Mill
"to be new ground.

"As for the *Peter*, that muſt in the Copper be diſſol-
"ved in as much water as will juſt take it up, and then
"the water muſt be boyled away till the *Peter* comes
"to the thickneſs of haſty-pudding. The reaſon of
"this operation is, becauſe when the *Peter* is thus
"ſoft, the other materials will the eaſilier incorporate
"with it, and in the next place it will not wear the
"wooden peſtles ſo much when it comes to the Mill,
"as when it is hard and dry.

"When the Materials are in this readineſs, they
"are weighed (only the *Peter* is weighed before it is
"put to diſſolve in the Copper) and by proportion
"are carried to the mingling Trough, which is made
"of boards, like a great Cheſt without a cover, being
"about eight foot long, four broad, and three foot
"high. The Coal is laid in firſt, the Brimſtone next,
"and the Peter at top of all; Then two men with
"ſhovels ſtir and mingle them together for an hour,
"and then 'tis ready for the Mill.

"The Powder-mills are ſeldom made to move
"with any thing but water: The great water-wheel
"is made like that of an ordinary water-wheel, ei-
"ther over-ſhot or under-ſhot, according to the
"quantity of water they have: to the *axis* of this
"wheel, a little way within the Mill, is faſtned a

"leſſer

"leſſer wheel called the Spar-wheel, with ſtrong "Cogs, which in their motion round take hold of "the round ſtaves of another wheel of about the "ſame diameter, ſet a little way above it, and faſtned "to the end of a beam of 15 or 16 foot long, laid "parallel to the Horizon, with an iron gudgeon at "the other end of it, to facilitate its motion round: "This beam is called the round beam; out of it "come a certain number of arms of about nine inch-"es long, and three inches broad, which in their go-"ing round meet with other leſſer armes (called "Tapes) coming out of the Peſtles (for ſo they call "certain ſmall quarters of Timber placed perpendi-"cular to the Horizon, about nine foot long and four "inches broad; they are ſet in a ſlight frame to keep "them ſteady); by theſe ſmall arms the Peſtles are "lifted up about two foot and a half, and then let "fall into a ſtrong wooden Trough ſet under them, "wherein the powder is put to be pounded.

"Every Mill hath two Troughs, and about ſixteen "Peſtles: every Peſtle hath faſtned to the lower end "of it a round piece of *Lignum Vitæ*, of about five "inches long and three and a half diameter; and in-"to the bottom of the Trough, juſt where the Peſtle "is to fall, is let in another piece of *Lignum Vitæ*, of "the faſhion and bigneſs of an ordinary Bowl, "ſplit according to its longeſt diameter: The Peſtles "are not lifted up all together, but alternatively, to "make the Powder turn the better in the working; "and for the ſame reaſon round Troughs are counted "better than ſquare.

"To make excellent Powder it ought to be "wrought thus thirty hours; but of late they will "not afford it above eighteen or twenty hours: once

"in

"in eight hours they uſe to moiſten the Powder with "a little fair water; others who are more curious, "put water ſomething thickned with quick-lime; o-"thers uſe White-wine Vinegar; others *Aqua-vitæ*: "But if it be not moiſtned with ſomething once in "eight hours, the Powder will grow dry, and in half "an hour after it will take fire. As ſoon as the Pow-"der grows dry, you may find it, though at a di-"ſtance, by the noiſe of the Mill; for then the Peſtles "will rebound from the bottom of the Trough and "make a double ſtroak. The only danger to the "Mill is not from the Trough; for many times the "iron Gudgeons grow hot for want of greaſing, and "then the duſt that flies about will be apt to fire, and "ſo the Mill blows up.

"From the Mill the Powder is brought to the "Corning-houſe, of a middle temper between moiſt "and dry. The way of corning it is with two hair "Sieves joyn'd together, the upper Sieve incloſing "ſome part of the hoop of the lower Sieve: The "upper Sieve hath holes of the ſize you will have "the Powder grained at; the holes of the lower "Sieve are much leſſer: The upper Sieve they call "their corning Sieve, the lower their wet Duſt-"er: They lay the Powder upon the upper Sieve "ſome two inches thick; upon that a piece of heavy "wood made like a Trencher, of about eight inches "diameter and two and a half in thickneſs, called a "Runner, which when the Sieve is moved, by its "weight and motion forces the Powder thorow the "upper Sieve, and that corns it. Then the lower "Sieve receives the Powder, and lets the duſt go "thorow into a Bin, over which the Sieve is ſhaken, "called the Duſting-Bin.

"When the Powder is thus corned, it is laid about "an inch and half thick on the drying Sieves, "which are made of courſe Canvaſe faſtned to ſlight "frames of Deal about an ell long and ſome twenty "inches broad; and thus it is carried into Stoves to "dry.

"The Stove is commonly a little Room about "eighteen or twenty foot ſquare, with ranges of ſmall "Firr poles about two foot one above another, to lay "the drying Sieves upon, but only on that ſide the "fire is made. Beſides a glaſs window to give light, "there muſt be a ſmall lover hole at the top of the "Room, to let out the ſteam, elſe the Powder will not "only be the longer a drying, but often by the return "of the ſteam on the Sieves, the top of the Powder "will be ſo cruſted that the lower part will not dry. "The Rome is heated by an Iron of about a yard high "and half a yard broad, caſt in the form of an Arch "equal to a Semy-quadrant, and placed in the back "of a Chimney, the fore part whereof is like a Fur- "nace; and to avoid danger, opens into another lit- "tle Room apart called the Stoke-hole.

"The Powder is brought into the Stove before it "be heated, and is not taken out again till the Stove "be cold; and about eight hours is required to the "drying of it. In hot Countries the Sun is the beſt "Stove, and a great deal of danger and charges that "way avoided.

"After the Powder is dried, it is brought again to "the Corning-houſe, where it is again ſifted over "the duſting Bin in other double Sieves, but without "any Runners. Theſe Sieves have both of them "ſmaller holes than the former: The upper Sieve is "called the Separater, and ſerves to divide the great

"corns

"corns from the leſſer; the great corns are put by "themſelves, and ſerve for Cannon Powder: The "lower Sieve is called the dry Duſter, and retains "the ſmall corns (which ſerve for Musquet and Piſtol) "and lets fall the duſt into the bin, which is to be "mingled with freſh Materials, and again wrought "over in the Mill.

"So that good Powder differs from bad (beſides "the well working and mingling of the Materials) "in having more *Peter* and leſs Coal; and laſtly, in "the well duſting of it.

"The laſt work is to put the Powder into Barrels; "every Barrel is to contain five ſcore weight of Pow-"der, and then 'tis ready for ſale.

AN APPARATUS TO THE HISTORY Of the Common Practices of DYING.

By Sir *WILLIAM PETTY.*

"IT were not incongruous to begin the Hiſtory "with a Retroſpect into the very nature of "Light it ſelf (as to inquire whether the ſame "be a Motion or elſe a Body;) nor to premiſe ſome "Theorems about the Sun, Flame, Glow-worms, "the eyes of ſome Animals, ſhining Woods, Scales "of ſome Fiſhes, the daſhing of the Sea, ſtroaks "upon the eyes, the *Bolonian* Slate (called by ſome "the Magnet of Light) and of other light and lucid "bodies.

"It were alſo not improper to conſider the very "eſſentials of Colour and Tranſparencies (as that the "moſt tranſparent bodies, if ſhaped into many an- "gles, preſent the eye with very many colours;) "That bodies having but one ſingle ſuperficies, have "none at all, but are ſuſcipient of every colour laid "before

"before them; That great depths of Air make a "Blew, and great depths of Water a Greeniſh co- "lour; That great depths or thickneſſes of colour- "ed Liquors do all look Blackiſh (red Wine in a "large Conical Glaſs being of all reddiſh colours "between black at the top and white at the bot- "tom.)

"That moſt Vegetables, at one time or other, are "greeniſh; and that as many things paſſing the Sun "are blackned, ſo many others much whitened by "the ſame: Other things are whitened by acid "Fumes, as red Roſes and raw Silks by the ſmoak "of Brimſtone.

"Many Mettals, as Steel and Silver, become of va- "rious colours and Tarniſh by the air, and by ſeveral "degrees of heat.

"We might conſider the wonderful variety of co- "lours appearing in Flowers, Feathers; and drawn "from Mettals, their Calces and Vitrifications; and "of the colours riſing out of tranſparent Liquors ar- "tificially mixed.

"But theſe things, relating to the abſtracted nature "of colours, being too hard for me, I wholly de- "cline; rather paſſing to name (and but to name) "ſome of the ſeveral ſorts of Colorations now com- "monly uſed in Humane affairs, and as vulgar Trades "in theſe Nations; which are theſe: *viz.*

1. "There is a whitening of Wax, and ſeveral "ſort of Linen and Cotton Cloathes, by the Sun, "Air, and by reciprocal effuſions of Water.

2. "Colouring of Wood and Leather by Lime, "Salt, and Liquors, as in Staves, Canes, and Marble "Leathers.

3. "Colouring of Paper, *viz.* Marbled Paper, by "diſtempering

"diſtempering the colours with Ox-gall, and apply-
"ing them upon a ſtiff gummed Liquor.

4. "Colouring, or rather Diſcolouring the colours
"of Silks, Tiffanies, *&c.* by Brimſtone.

5. "Colouring of ſeveral Iron and Copper work,
"into Black, with Oyl.

6. "Colouring of Leather into Gold-colour, or-
"rather Silver leaves into Gold by Varniſhes, and in
"other caſes by Urine and Sulphur.

7. "Dying of Marble and Alabaſter with heat
"and coloured Oyls.

8. "Colouring Silver into Braſs with Brimſtone
"or Urine.

9. "Colouring the Barrels and Locks of Guns in-
"to Blew and Purple with the temper of Small-coal
"heat.

10. "Colouring of Glaſs (made of Sands, Flints,
"*&c.*) as alſo of Cryſtals and Earthen Ware, with
"the ruſts and ſolutions of Metals.

11. "The colouring of live Hair, as in *Poland*,
"Horſe and Mans Hair; as alſo the colouring of
"Furrs.

12. "Enameling and Anealing.

13. "Applying Colours as in the Printing of
"Books and Pictures, and as in making of playing
"Cards; being each of them performed in a ſeveral
"way.

14. "Guilding and Tinning with *Mercury*, *Block-*
"*Tin*, *Sal-Armoniack*.

15. "Colouring Metals, as Copper with *Calamy*
"into Braſs, and with *Zink* or *Spelter* into Gold, or
"into Silver with *Arſenick*: And of Iron into Cop-
"per with *Hungarian Vitriol*.

16. "Making Painters Colours by preparing of
"Earth,

"Earth, Chalk, and Slates; as in *Umber*, *Oker*, *Cul-*
"*len-earth*, *&c.* as alſo out of the Calces of Lead, as
"*Ceruſe* and *Minium*; by Sublimates of Mercury and
"Brimſtone, as in *Vermilion*; by tinging of white
"Earths variouſly, as in *Verdeter*, and ſome of the
"*Lakes*; by concrete Juyces or *Fæculæ*, as in *Gam-*
"*brugium*, *Indico*, *Pinks*, *Sap-green*, and *Lakes*: As
"alſo by Ruſts, as in *Verdegreaſe*, *&c*,

17. "The applying of theſe colours by the adhe-
"ſion of Ox-gall, as in the Marbled Paper aforeſaid;
"or by Gum water, as in Limning; or by clammy
"drying Oyls, (ſuch as are the Oyls of Linſeed, Nuts,
"Spike, Turpentine, *&c.*)

18. "Watering of *Tabbies*.

19. "The laſt I ſhall name is the colouring of
"Wool, Linnen, Cotton, Silk, Hair, Feathers, Horn,
"Leather, and the Threads and Webs of them with
"Woods, Roots, Herbs, Seeds, Leaves, Salts, Limes,
"Lixiviums, Waters, Heats, Fermentations, Macera-
"tions, and other great variety of Handling: An ac-
"count of all which is that Hiſtory of Dying we in-
"tend. All that we have hitherto ſaid being but a
"kind of remote and ſcarce pertinent Introduction
"thereunto.

"I begin this Hiſtory by enumerating all the ſeve-
"ral Materials and Ingredients which I underſtand
"to be or to have been uſed in any of the laſt afore-
"mentioned Colorations, which I ſhall repreſent in
"various Methods, *viz.* out of the *Mineral* Family.
"They uſe Iron and Steel, or what is made or comes
"from them, in all true Blacks (called *Spaniſh* Blacks)
"though not in *Flanders* Blacks; *viz.* they uſe Cop-
"peras, Steel-filings, and Slippe, which is the ſtuff
"found in the Troughs of Grind-ſtones, whereon

"Edge-

"Edge-tools have been ground. They alſo uſe Pew-
"ter for Bow-dye, Scarlet, *viz.* they diſſolve Bars of
"Pewter in the *Aqua fortis* they uſe; and make alſo
"their Dying-kettles or Furnace of this Mettal.

"*Litharge* is uſed by ſome, though acknowledged
"by few, for what neceſſary reaſon I cannot learn, o-
"ther than to add weight unto Dyed Silk; *Litharge*
"being a calx of Lead, one of the heavieſt and moſt
"colouring Mettals.

"I apprehend *Antimony* much uſed to the ſame
"purpoſe, though we know there be a very tingent
"Sulphur in that Mineral, which affordeth variety of
"Colour by the precipitations and other operations
"upon it.

"*Arſenick* is uſed in Crimſon, upon pretence of
"giving Luſtre, although thoſe who pretend not to
"be wanting in giving Luſtre to their Silks, do utter-
"ly diſown the uſe of *Arſenick*.

"*Verdegreaſe* is uſed by Linnen Dyers in their
"Yellow and Greeniſh Colours, although of it ſelf
"it ſtrike not deeper colour than of pale Straws.

"Of *Mineral-Salts* uſed in *Dying*; the chief is
"Allum; the very true uſe thereof ſeems to me ob-
"ſcure enough, notwithſtanding all the Narrations
"I could get from Dyers about it: For I doubt,

"1. Whether it be uſed to make Common-water
"a fit *Menſtruum*, wherewith to extract the Tingent
"particles of ſeveral hard Materials; for I find Al-
"lum to be uſed with ſuch Materials as ſpend eaſy
"enough, as Braſill, Logwood, *&c.* And withal,
"that the Stuffs to be dyed are firſt boyled in Allum-
"liquors, and the Allum afterwards (as they ſay)
"cleared from the ſaid Stuff again, before any Co-
"lour at all be applyed.

"2. Whether it be uſed to ſcour the *Sordes*, which
"may

"may interpoſe between the *Coloranda*, and the "Dying Stuff; and ſo hinder the due adheſion of "the one unto the other: The boyling of ſeveral "things firſt in Allum ſeeming to tend this way. But "I find this work to be done in Cloth and Rugs, by "a due ſcouring of the ſame in the Fulling-mills with "Earth, and in Silk with Soaps, by which they boyl "out the Gums and other *Sordes*, hindring or vitia- "ting the intended Colours.

"3. Whether Allum doth intenerate the Hairs of "Wool, and Hair-ſtuff, as Grograins, *&c.* Where- "by they may the better, receive and imbibe their "Colours? Unto which opinion I was led by the "Dyers; ſaying, that after their Stuffs were well "boyled in Allum, that they then cleared them of "the Allum again: But we find the moſt open Bo- "died-Cottons and Silks, to have Allum uſed upon "them; as well as the harder Hairs. Nor is Allum "uſed in many Colours, *viz.* In no Woad or Indico "Blews; and yet the Stuffs Dyed Blew, are with- "out any previous inteneration quickly tinged; "and that with a ſlight and ſhort immerſion thereof "into the Blew fat.

4. "Whether it contribute to the Colour it ſelf, "as Copperas doth to Gals, in order to make a black; "or as Juice of Lemmons doth to Cocheneel in the "*Incarnadives*; or as *Aqua-Fortis* impregnated with "Pewter, doth in the Bow-Scarlet, changing it from "a red Roſe-Crimſon to flame Colour. This uſe is "certainly not to be denyed to Allum in ſome caſes; "but we ſee in other caſes, that the ſame Colours may "be Dyed without Allum, as well as with it, though "neither ſo bright and lively, nor ſo laſting.

5. "Wherefore Fifthly, I conclude (as the moſt

"probable opinion) that the uſe of Allum is to be a "*Vinculum* between the Cloth and the Colour, as "clammy-Oyls and Gum-waters are in Painting and "Limming; Allum being ſuch a thing, whoſe particles "and *Aculei* diſſolved with hot Liquors will ſtick to "the Stuffs, and pitch themſelves into their Pores; and "ſuch alſo, as on which the particles of the Dying "Drugs will alſo catch hold, as we ſee the particles "of Copperas and other Cryſtallizing materials, do "of Boughs and Twigs in the Veſſel, where ſuch "Cryſtallization is made. A ſecond uſe I imagine "of Allum in Dying, to be the extracting or drying "up of ſome ſuch particles, as could not conſiſt with "the Colour to be ſuperinduced, for we ſee Allum "is uſed in the dreſſing of *Alutas* or white Leather, "the which it dryeth, as the Salt of Hen-dung doth "in Ox-hides, and as common Salt doth in preſerva-"tion of Fleſh-meats; for we know, a Sheep-ſkin "newly flayed could not be Colour'd as Braſils are, "unleſs it were firſt dreſſed into Leather with Allum, "*&c.* which is neceſſary to the Colour, even although "the Allum be, as it is, cleared out of the Leather "again, before the ſaid Colouration, with Bran, "yelks of Eggs, *&c.* Wherefore as Allum, as it "were by accident, makes a wet raw ſkin to take a "bright Colour by extracting ſome impedimental "particles out of it; ſo doth it alſo out of other ma-"terials, though perhaps leſs diſcernably.

"Another uſe I ſuppoſe of Allum, which is to "brighten a Colour: For as we ſee the fineſt and "moſt Glaſſie materials to make the moſt orient "Colours, as Feathers, Flowers, *&c.* So certainly "if by boyling Cloth in Allum, it become incruſta-"ted with particles, as it were of Glaſs, the tinging

"of

"of them yields more brightneſs, than the tinging of "a Scabrous matter, (ſuch as unallumed Cloth is) "can do. *Analogous* hereunto I take the uſe of Bran, "and Bran-liquors in Dying to be; for Bran yielding "a moſt fine flower (as we ſee in the making of white-"Starch;) I conceive that this flower entring into "the pores of the Stuff, levigates their *Superficies* and "and ſo makes the Colour laid on it, the more beau-"tiful, juſt as we ſee, that all woods, which are to "be guilded are firſt ſmoothned over with white Co-"lours, before the Gold be laid on.

"And indeed all other Woods are filled, not only "as to their greater holes and Aſperities, with *Putty*; "but alſo their ſmaller Scabrities are cured by pri-"ming Colours, before the Ultimate Colour intend-"ed be laid thereon.

"The next Mineral Salt is *Salt-Peter*, not uſed by "ancient Dyers, and but by few of the modern. "And that not, till the wonderfull uſe of *Aqua-fortis* "(whereof *Salt-Peter* is an ingredient) was obſerv-"ed in the Bow-Scarlet: Nor is it uſed now, but to "brighten Colours by back-boyling them; for which "uſe *Argol* is more commonly uſed. Lime is much "uſed in the working of blew-fats, being of Lime-"ſtone calcined and called *Calke*, of which more "hereafter.

"Of the *Animal* family are uſed about Dying, "Cochineel (if the ſame be any part of an *Animal*) "Urine of labouring men, kept till it be ſtale and "ſtinking; Honey, Yelks of Eggs, and Ox-gall. The "three latter ſo rarely; and as the conceits of par-"ticular Work-men, and for Collateral uſes (as to "increaſe weight, promote fermentation, and to "ſcour, *&c.*) That I ſhall ſay very little more of them

"in this place, only ſaying of Urine that it is uſed to "ſcour, and help the fermenting and heating of "Woad; it is uſed alſo in the blew-fats inſtead of "Lime: It diſchargeth the yellow (of which and "blew, moſt Greens are compounded) and there-"fore is alwayes uſed to ſpend *Weld* withal. Laſtly, "the ſtale Urine, or old mudd of piſſing places, will "colour a well ſcoured ſmall piece of Silver, into a "Golden colour, and it is with this (and not at all "with the Bath-water) wherewith the Boys at *Bath* "colour ſingle pence; although the generality be-"lieve otherwiſe. Laſtly it ſeems to me, that Urine "agreeth much in its Nature with *Tartarous Lixivia*; "not only becauſe Urine is a Lye made of Vegeta-"bles in the body of *Animals*; nor becauſe in the "Receptacles of Urine, *Tartarous* ſtones are bred "like as in Veſſels of Wine; nor becauſe Urine diſ-"charges and abrades Colours as the *Lixivia* of *Tar-"tar*, or the deliquated Salts of *Tartar* do; but be-"cauſe *Tartar* and *Sulphur-Lixivia* do colour the "ſuperficies of Silver, as we affirmed of Urine; and "the difference I make between Urine and *Tartarous* "*Lixivia* is only this, that though the Salts of both "of them ſeem by their effects in Dying, in a manner "the ſame; yet that Urine is made and conſiſts of "Salt and Sulphur both.

"Before we enter upon the *Vegetable* materials for "Dying, we may interpoſe this Advertiſement, That "there are two ſorts of Water uſed by Dyers, *viz.* "River-water and Well-water: By the latter I mean "in this place the Pump-water in great Cities and "Towns, which is a harſh Water wherewith one can "ſcarce waſh ones hands, much leſs ſcour them clean; "nor will Soap diſſolve in it, but remains in rolls and "lumps:

"lumps: moreover the Fleſh boyled in it becomes "hard and reddiſh. The Springs riſing out of large "covered ſpaces (ſuch as are great Cities) yield this "Water, as having been percolated thorow more "ground than other Water, and conſequently been "diveſted of its fatty earthy particles, and more im-"pregnated with ſaline ſubſtances in all the way it "hath paſſed. The Dyers uſe this Water in Reds, "and in other colours wanting reſtringency, and in "the Dying of Materials of the ſlacker Contextures, "as in Callico, Fuſtian, and the ſeveral ſpecies of Cot-"ton-works. This Water is naught for Blews, and "makes Yellows and Greens look ruſty.

"River-water is far more fat and oylie, ſweeter, "bears Soap; that is, Soap diſſolves more eaſily in it, "riſing into froth and bubbles, ſo as the Water thick-"ens by it. This Water is uſed in moſt caſes by Dy-"ers, and muſt be had in great quantities for waſhing "and rinſing their Cloathes after Dying.

"Water is called by Dyers White Liquor; but "there is another ſort of Liquor called Liquor abſo-"lutely, and that is their Bran-liquor, which is one "part of Bran and five of River-water, boyled toge-"ther an hour, and put into leaden Ciſterns to ſettle. "This Liquor when it turns ſour is not good, which "ſourneſs will be within three or four days in the "Summer time. Beſides the uſes afore-named of "this Liquor, I conceive it contributes ſomething to "the holding of the Colour; for we know Starch, "which is nothing but the flower of Bran, will make "a clinging Paſte, the which will conglutinate ſome "things, though not every thing; *viz.* Paper, though "neither Wood nor Mettals. Now Bran-liquors are "uſed to mealy dying Stuffs, ſuch as *Mather* is, being

"the

"the Powder or *fecula* of a Root; So as the flower "of the Bran being joyned with the *Mather*, and "made clammy and glutinous by boyling, I doubt "not but both ſticking upon the *villi* of the Stuff Dy- "ed, the *Mather* ſticks the better by reaſon of the "ſtarchy paſtineſs of the Bran-flower joyned with "it.

"Gums have been uſed by Dyers about Silk, *viz.* "*Gum Arabick*, *Gum Dragant*, *Maſtick*, and *Sanguis* "*Draconis*. Theſe Gums tend little to the tincture "of the ſaid Silk, no more than Gum doth in ordina- "ry writing Ink, which only gives it a conſiſtence to "ſtay juſt where the Pen delivers it, without run- "ning abroad uncertainly: So Gum may give the "Silk a glaſſineſs, that is, may make it ſeem finer, as "alſo ſtiffer; ſo as to make one believe the ſaid ſtiff- "neſs proceeded from the quantity of Silk cloſe wo- "ven: And laſtly to increaſe weight; for if an ounce "of Gum, worth a peny, can be incorporated into a "pound of Silk, the ſaid penny in the Gum produ- "ceth three ſhillings, the price of an ounce of Silk. "Wherefore we ſhall ſpeak of the uſe of each of the "ſaid four Gums, rather when we treat of Siſing and "Stiffening, than now, in a Diſcourſe of Dying, "where alſo we may ſpeak of Honey and Molaſſes.

"We refer alſo the Deſcriptions of Fullers-earth, "Soaps, Linſeed-oyl, and Ox-galls, unto the head of "Scouring, rather than to this of Dying.

"Wines and *Aqua-vitæ* have been uſed by ſome "particular Artiſts; but the uſe of them being nei- "ther conſtant nor certain, I omit further mention of "them. The like I ſay of Wheaten-flower and "Leaven.

"Of *Cummin-ſeed*, *Fenugreek-ſeed*, *Senna*, and *A-*

"*garick*,

"*garick*, I have as yet no ſatisfactory accompt.

"Having ſpoken thus far of ſome of the Dying "ſtuffs, before I engage upon the main, and ſpeak "more fully of thoſe which have been but ſlightly "touched upon already, I ſhall more Synoptically "here inſert a Catalogue of all Dying Materials, as "well ſuch as I have already treated upon, as ſuch as "I intend hereafter to deſcribe.

"The three peculiar Ingredients for Black are "Copperas, filings of Steel, and Slippe.

"The Reſtringent binding Materials are Alder, "Bark, Pomegranate Pills, Wallnut rinds and roots, "Oaken Sapling Bark, and Saw-duſt of the ſame; "Crab-tree Bark, Galls, and Sumach.

"The Salts are Allum, Argol, Salt-peter, *Sal Ar-"moniack*, Pot-aſhes, and Stone-lime; unto which "Urine may be enumerated as a liquid Salt.

"The Liquors are Well-water, River-water, Wine, "*Aqua-vitæ*, Vinegar, juyce of Lemmon, and *Aqua-"fortis*: There is Honey uſed, and Molaſſes.

"Ingredients of another *Claſſis* are Bran, Wheat-"en-flower, Yelks of Eggs, Leaven, Cummin-ſeed, "Fenugreek-ſeed, Agarick, and Senna.

"Gums are *Gum Arabick*, *Dragant*, *Maſtick*, and "*Sanguis Draconis*.

"The Smecticks or Abſterſives are Fullers-earth, "Soap, Linſeed-oyl, and Ox-gall.

"The other Metals and Minerals are Pewter, Ver-"degreaſe, Antimony, Litharge, and Arſenick.

"But the *Colorantia colorata* are of three ſorts, *viz.* "Blew, Yellow, and Red; of which Logwood old "Fuſtick, and Mather, are the *Polychreſta* in the pre-"ſent & common practices, being one of each ſort. The "Blews are Woad, Indico, and Logwood: The Yel-

"lows

"lows are Weld, Wood-wax, and old Fuſtick, as alſo "Turmerick now ſeldom uſed: The Reds are Red-"wood, Brazel, Mather, Cochineel, Safflowrs, Ker-"mes-berries, and Sanders; the latter of which is "ſeldom uſed, and the Kermes not often. Unto theſe "*Arnotto* and young Fuſtick, making Orange colours, "may be added, as often uſed in theſe times.

"In Cloth Dying wood-ſoot is of good uſe.

"Having preſented this Catalogue, I come now to "give or enlarge the Deſcription and Application of "ſome of the chief of them, beginning with Cop-"peras.

"Copperas is the common thing us'd to dye Blacks "withal, and it is the ſalt of the *Pyrites* ſtone, where-"with old Iron (having been diſſolved in it) is incor-"porated. The filings of Steel, and ſuch ſmall par-"ticles of Edge-tools as are worn away upon the "Grindſtone, commonly called Slipp, is uſed to the "ſame purpoſe in dying of Silks (as was ſaid before) "which I conceive to be rather to increaſe the weight "than for any other neceſſity; the particles of Cop-"peras being not ſo heavy and craſs as theſe are: for "elſe why ſhould not theſe later-named Materials be "as well uſed about Cloth, and other cheaper Stuffs?

"We obſerve, That green Oaken-boards by affri-"ction of a Saw become black; and that a green ſour "Apple, cut with a knife, becomes likewiſe black; "and that the white greaſe wherewith Coach-wheels "are anointed becomes likewiſe black, by reaſon of "the iron boxes wherewith the Nave is lined, beſides "the uſtulation or affriction between the Nave and "the Axel-tree. Moreover we obſerve, That an Oak-"en ſtick, by a violent affriction upon other wood in "a Turning-Lath, makes the ſame black.

"From

"From all which we may obſerve, That the whole "buſineſs of Blacking lies in the Iron, as if the ſalt of "the *Pyrites*-ſtone in Copperas ſerved only to extract "the ſame; and withal it ſeems to lie in a kind of "ſindging and uſtulation, ſuch as rapid affrictions do "cauſe: For Allum ſeems to be of the ſame nature "with Vitriol; and yet in no caſe that I know of is, it "is uſed for black colours: And the black colour "upon earthen Ware is made with ſcalings of Iron "vitrified. Note, That where-ever Copperas is "uſed, either Galls, Sumach, Oak Sapling-barks, "Alder-bark, Wallnut-rinds, Crabtree-bark, or "green Oak ſaw-duſt, muſt be uſed with it; All "which things Phyſicians call Auſtere and Stiptick.

"Red-wood muſt be chopt into ſmall pieces, then "ground in a Mill between two heavy ſtons, as corn "is. It is uſed alſo in Dying of Cloth and Rugs, "and thoſe of the Courſer ſort: The colour is ex-"tracted with much and long boyling, and that with "Galls. The colour it makes is a kind of Brick-co-"lour Red; it holdeth much better than Braſil. The "Cloth it dyeth is to be boyled with it: Wherefore "only ſuch matters as are not prejudiced by much "boyling are dyed herewith.

Braſil is chopt and ground like as the Red-wood: "It dyeth a Pink-colour or Carnation, imitating the "colour of Cochineil the neareſt: It is uſed with "Allum for the ordinary colour it dyeth; and with "addition of Pot-aſhes, when it is uſed for Purples.

Braſil ſteept in Water giveth it the colour of Clar-"ret-wine, into which a drop or two of Juyce of "Lemmons or Vinegar being put, turneth it into the "colour of Canary-Sack; in which particular it a-"greeth with Cochineil. This Colour ſoon ſtaineth,

"as may appear by the eaſie change which ſo ſmall a "quantity of acid liquor makes upon it. A drop of "Spirit of Vitriol turneth the infuſion of Braſil into a "purpliſh violet-colour, even although it hath been "made yellow before, by the addition of Juyce of "Lemmons or Vinegar; and is the ſame effect which "Pot-aſhes alſo produce, as we ſaid before.

"*Mather* is a Root cultivated much in *Flanders*: "There be of it two ſorts; *Pipe-Mather*, which is "the courſeſt; and *Bale-Mather*, otherwiſe called "*Crap-Mather*: This *Mather* uſed to the beſt advan- "tage, dyeth on Cloth a colour the neereſt to our "Bow-dye, or the new Scarlet; the like whereof "Safflowr doth in Silk; inſomuch as the colours cal- "led Baſtard-Scarlets are dyed with it. This colour "indures much boyling, and is uſed both with Allum "and Argol; it holdeth well. The brighteſt colours "dyed with this material are made by over-dying the "ſame, and then by diſcharging part of it by back- "boyling it in Argol.

"*Mather* is uſed with Bran-liquor, inſtead of "White-liquor or ordinary Water.

"*Cochineel* is of ſeveral ſorts, *viz. Silveſter* and *Me- "ſtequa*: This alſo is uſed with Bran-liquor in Pew- "ter-Furnaces, and with *Aqua-fortis*, in order to the "Scarlet-dye. It is the colour whereof the like quan- "tity effecteth moſt in Dying; and Colours dyed "with it, are ſaid to be dyed in Grain. Rags dyed "in the dregs of this colour is called *Turnſole*, and 'tis "uſed to colour Wines; *Cochineel* being counted ſo "far from an unwholeſom thing, that it is eſteemed a "Cordial. Any acid Liquor takes off the intenſe "Redneſs of this colour, turning it towards an O- "range, Flame, or Scarlet-colour: With this colour

"alſo

"alſo the *Spaniſh* Leather and Flocks are dyed which "Ladies uſe. The extract or *fecula* hereof makes the "fineſt *Lake*.

"*Arnotto* Dyeth of it ſelf an Orang-colour, is uſed "with Pot-aſhes upon Silk, Linnen, and Cottons, "but not upon Cloth, as being not apt to penetrate "into a thick ſubſtance.

"*Weld*, called in Latin *Luteola*; when 'tis ripe "(that is to ſay, in the flower) it Dyeth (with the "help of Pot-aſhes) a deep Lemon colour, like un- "to *Ranunculus*, or Broom flower; and either by "the ſmalneſs of proportion put into the Liquor, or "elſe by the ſlighter tincture, it Dyeth all Colours "between White and the Yellow aforeſaid.

"In the uſe of this material, Dyers uſe a croſs, "driven down into their Furnace with a ſcrew to "keep it down, ſo as the Cloth may have liberty in "the ſupernatant Liquor, to be turned upon the "Winch and kept out with the ſtaves: This weed is "much cultivated in *Kent*, for the uſe of the *London*- "Dyers, it holdeth ſufficiently well but againſt U- "rine and *Tartarous* Liquors. Painters Pinke is made "of it.

"*Wood wax*, or *Geniſta Tinctoria* (commonly cal- "led Graſing weed by the Dyers,) produces the ſame "effect with *Luteola*, being uſed in greater quanti- "ties: It is ſeldome made uſe of as to Silk, Linnen, "or Cottons, but only as to courſe Cloths: It is "alſo ſet with Pot-aſhes or Urine, called by the Dy- "ers *Siggefuſtick*; of it there be two ſorts, the *young* "and the *old*: *Fuſtick* is chopt and ground, as the "other Woods abovementioned are.

"The *young Fuſtick* Dyeth a kind of Reddiſh- "Orang-colour; the *old*, a Hair-colour with ſeveral

"degrees of yellowneſs between: It is uſed with "ſlacked Lime. The Colours Dyed with *old Fu-* "*ſtick* hold extreamly; and are not to be diſcharg- "ed, will ſpend *with* Salts or *without*, and will work "hot or cold.

"*Soot of Wood. Soot* containeth in it ſelf both a "Colour and Salt; wherefore there is nothing add- "ed to it to extract its Colour, nor to make it ſtrike "upon the Stuff to be Dyed; the natural Colour "which it Dyeth of it ſelf, is the Colour of Honey; "but is the foundation of many other Colours upon "Wool and Cloth; for to other things 'tis not "uſed. *Woad* is made of a Weed, ſown upon ſtrong "new-broken Land, perfectly cleered from all ſtones "and weeds, cut ſeveral times by the top leaves, "then ground, or rather chopt with a peculiar Mill "for that purpoſe; which being done ſeveral times, "it is made up in Balls and dryed in the Sun; the "dryer the year is, the better the Woad.

"When it is made up in Balls, it is broken again "and laid in heaps, where if it heat too faſt, it is "ſprinkled with ordinary water: but if it heat too "ſlowly, then they throw on it a quantity of Lime, "or Urine. But of the perfect cultivating and cu- "ring of Woad, we ſhall ſpeak elſewhere.

"*Engliſh Woad* is counted the ſtrongeſt, it is com- "monly tryed by ſtaining of white Paper with it, or "a white Limed wall, and if the Colour be a French- "green it is good.

"*Woad* in uſe, is uſed with Pot-aſhes commonly "called Ware, which if it be double refin'd, is cal- "led hard Ware (which is much the ſame with Kelp) "or Sea-weeds, calcin'd and burnt into the hardneſs "of a ſtone, by reiterated Calcinations.

"*Lime-*

"*Lime*, or *Calke* which is ſtrong Lime, is uſed to "accelerate the fermentation of the Woad, which "by the help of the ſame Pot-aſhes and warm liquors "kept alwayes ſo, in three or four dayes will come "to work like a Kive of Beer, and will have a blew "or rather greeniſh froth or flowry upon it, anſwer-"ing to the Yeſt of the Kive. Now the over-quan-"tity of Ware, fretting too much upon the Woad, is "obtunded or dulled by throwing in Bran ſometimes "looſe, ſometimes in Baggs.

"The making and uſing Woad, is one of the moſt "myſterious, nice, and hazardous operations in Dy-"ing: It is one of the moſt laſting Colours that is "Dyed: An intenſe Woad-Colour is almoſt black, "that is to ſay, of a Damſon-colour; this Colour is "the foundation of ſo many others in its degree, that "the Dyers have a certain Scale, or number of Stalls, "whereby to compute the lightneſs and deepneſs of "this Colour.

"*Indico* is made of a Weed of the ſame Nature "with Woad, but more ſtrong; and whereas Woad "is the whole ſubſtance of the Herb, Indico is only "a mealy concrete juice or *fæcula* dryed in the Sun, "ſometimes made up in flat Cakes, ſometimes into "round-balls, there be ſeveral ſorts of Indico.

"*Logwood* is chopt and ground like other of the "Woods abovementioned, it maketh a Purpliſh-"blew; may be uſed without Allum: It hath been "eſteemed a moſt falſe and fading Colour; but "now being uſed with Galls, is far leſs complained "of.

General

General Obſervations upon

DYING.

"FIrſt, that all the materials (which of themſelves "do give Colour) are either Red, Yellow, or "Blew, ſo that out of them, and the primitive fun-"damental Colour, White; all that great variety "which we ſee in Dyed Stuffs doth ariſe.

"2. That few of the Coloring materials (as "Cochineil, Soot, Wood-wax, Woad,) are in their "outward and firſt appearance of the ſame Colour, "which by the ſlieghteſt diſtempers and ſolutions in "the weakeſt *Menſtrua*, the Dye upon Cloth, Silk, "*&c.*

"3. That many of the Colouring materials will "not yield their Colours without much grinding, "ſteeping, boyling, fermenting, or corroſion by pow-"erful *Menſtrua*; as Red-wood, Weld, Woad, Ar-"notto, *&c.*

"4. That many of the ſaid Coulouring materials "will of themſelves give no Colouring at all, as "Copperas, or Galls, or with much diſadvantage, "unleſs the Cloth or other Stuff to be Dyed, be as "it were, firſt covered or incruſtated with ſome "other matter, though Colour-leſs, aforehand, as "Mather, Weld, Braſil with Allum.

"5. That ſome of the ſaid Colouring materials, "by the help of other Colour-leſs Ingredients, do "ſtrike different Colours from what they would a-"lone, and of themſelves; as Cochineil, Braſil, "*&c.*

"6. That

"6. That ſome Colours, as Mather, Indico, and "Woad, by reiterated tinctures, will at laſt become "black.

"7. That although Green be the moſt frequent and "common of natural Colours, yet there is no ſimple "ingredient, which is now uſed alone, to Dye Green "with upon any Material; *Sap-green* (being the con-"denſated juyce of the *Rhamnous Berry*) being the "neereſt; the which is uſed by Country people.

"8. There is no Black thing in uſe which dyes "black; though both the coal and ſoot of moſt things "burnt or ſcorched be of that colour; and the "blacker, by how much the matter before it was "burnt was whiter, as in the famous inſtance of "*Ivory-black*.

"9. The Tincture of ſome Dying Stuffs will fade "even with lying, or with the Air, or will ſtain "even with Water; but very much with Wine, Vi-"negar, Urine, *&c.*

"10. Some of the Dyers Materials are uſed to bind "and ſtrengthen a Colour, ſome to brighten it, ſome "to give luſtre to the ſtuff, ſome to diſcharge and take "off the colour either in whole or in part, and ſome "out of fraud, to make the Material Dyed (if coſt-"ly) to be heavyer.

"11. That ſome Dying Ingredients or Drugs, by "the courſeneſs of their bodies, make the thread of "the dyed Stuff ſeem courſer; and ſome by ſhrink-"ing them, ſmaller, and ſome by levigating their A-"ſperities, finer.

"12. Many of the ſame colours are dyed upon ſe-"veral Stuffs with ſeveral Materials; as *Red-wood* "uſed in Cloth, not in Silks; *Arnotto* in Silks, not in "Cloth; and may be dyed at ſeveral prizes.

"13. That

"13. That Scowring and Waſhing of Stuffs to be "dyed, is to be done with ſpecial Materials; as ſome- "times with Ox-galls, ſometimes with Fullers earth, "ſometimes with Soap: This latter being pernicious "in ſome caſes, where Pot-aſhes will ſtain or alter the "colour.

"14. Where great quantities of Stuffs are to be "dyed together, or where they are to be done with "great ſpeed, and where the pieces are very long, "broad, thick, or otherwiſe, they are to be diffe- "rently handled, both in reſpect to the Veſſels and "Ingredients.

"15. In ſome Colours and Stuffs the Tingent Li- "quor muſt be boyling; in other caſes blood-warm; "in ſome it may be cold.

"16. Some Tingent Liquors are fitted for uſe by "long keeping; and in ſome the vertue wears away "by the ſame.

"17. Some Colours or Stuffs are beſt dyed by re- "iterated Dippings ever into the ſame Liquor at ſe- "veral diſtances of time; and ſome by continuing "longer, and others leſſer whiles therein.

"18. In ſome caſes the matter of the Veſſel where- "in the Liquors are heated, and the Tinctures prepa- "red, muſt be regarded; as the Kettles muſt be Pew- "ter for Bow-dye.

"19. There is little reckoning made how much "Liquor is uſed in proportion to the dying Drugs; "the Liquor being rather adjuſted to the bulk of the "Stuff, as the Veſſels are to the breadth of the ſame: "The quantity of dying Drugs being proportioned "to the colour higher or lower, and to the Stuffs "both; as likewiſe the Salts are to dying Drugs.

"Concerning the weight which Colours give to "Silk

"Silk (for in them 'tis moſt taken notice of, as being "ſold by weight, and being a Commodity of great "price:) It is obſerved, That one pound of raw Silk "loſeth four ounces by waſhing out the Gums and "natural *Sordes*.

"That the ſame ſcowred Silk may be raiſed to "above thirty ounces from the remaining twelve, if "it be dyed black with ſome Materials.

"The reaſon why Black colour may be moſt heavy "dyed, being becauſe all gravitating Drugs may be "dyed black, being all of colours lighter than it: "whereas perhaps there are few or no Materials "wherewith to increaſe the weight of Silk, which "will conſiſt with fair light colours; ſuch as will ha-"ving been uſed, as white Arſenick to Incarnadives. "Of a thing truly uſeful in Dying, eſpecially of Blacks, "nothing increaſes weight ſo much as Galls, by reaſon "whereof Black Silks are reſtored to as much weight "as they loſt by waſhing out their Gum: Nor is it "counted extraordinary, that Blacks ſhould gain a-"bout four or ſix ounces in the Dying upon each "pound.

"Next to Galls old Fuſtick increaſes the weight "about 1 ½ in 12.

"Mather about one ounce.

"Weld half an ounce.

"The Blew-fat, in deep Blews of the fifth ſtall, "gives no conſiderable weight.

"Neither doth Logwood, Cochineel, nor Arnotto: "Nor doth Copperas it ſelf, where Galls are not.

"I conceive much light would be given to the "Philoſophy of Dying, by careful Experiments of "the weight added by each Drug or Salt in Dying of "every colour.

" *Sipp* adds much to the weight, and giveth a " deeper Black than *Copperas* it ſelf; which is a good " excuſe for the Dyers that uſe it.

" I have hitherto but mentioned the ſeveral Colo- " rations uſed in Humane Affairs, Enumerated the " ſeveral Materials uſed in one of them, namely, Dy- " ing; and imperfectly deſcribed the ſeveral uſes and " applications of them in Dying. I have alſo ſet " down ſome general Obſervations relating to that " whole Trade. It remains now that we deſcribe the " ſeveral Veſſels, Tools, and Utenſils uſed in the ſame. " And particularly to ſhew how any Colour aſſigned " may be ſuperinduced upon any kind of Material, " as Wool, Linnen, Hair, Feathers, Cotton or Silk: " And with what Advantages or Diſadvantages of " Laſting, Brightneſs, Cheapneſs, and Variety, *&c.* " each may be performed. But this being infinite, " and almoſt unteachable by words, as being incom- " parably more difficult, than how to imitate and " compoſe any Colour aſſigned, out of the few, uſual- " ly furniſhing a Painters-palat; I leave the whole to " the further conſideration of this Learned Society.

THE

THE HISTORY

Of the Generation and Ordering of

GREEN OYSTERS,

Commonly called

Colcheſter-Oyſters.

"IN the Month of *May* the *Oyſters* caſt their Spaun "(which the Dredgers call their Spat;) it is "like to a drop of Candle, and about the Big-"neſs of a half-penny.

"The Spat cleaves to Stones, old Oyſter-ſhells, "pieces of Wood, and ſuch like things, at the bot-"tom of the Sea, which they call Cultch.

"'Tis probably conjectured, that the Spat in "twenty four hours begins to have a Shell.

"In the Month of *May* the Dredgers (by the Law "of the Admiralty Court) have liberty to catch all "manner of *Oyſters*, of what ſize ſoever.

"When they have taken them, with a knife they "gently raiſe the ſmall brood from the Cultch, and "then they throw the Cultch in again, to preſerve "the ground for the future, unleſs they be ſo newly "Spat that they cannot be ſafely ſevered from the "Cultch, in that caſe they are permitted to take the "ſtone or ſhell, *&c.* that the Spat is upon, one Shell "having many times 20 Spats.

"After the Month of *May* it is Felony to carry a-"way the Culteh, and puniſhable to take any other "*Oyſters*, unleſs it be thoſe of ſize (that is to ſay) a-"bout the bigneſs of an half Crown piece, or when "the two ſhells being ſhut, a fair ſhilling will rattle "between them.

"The places where theſe *Oyſters* are chiefly catcht, "are called the *Pont-Burnham*, *Malden*, and *Colne*-"Waters; the latter taking its name from the Ri-"ver of *Colne*, which paſſeth by *Colne-Cheſter*, gives "the name to that Town, and runs into a Creek of "the Sea at a place called the *Hythe*, being the Sub-"urbs of the Town.

"This Brood and other *Oyſters* they carry to "Creeks of the Sea at *Brickel-Sea*, *Merſey*, *Langno*, "*Fringrego*, *Wivenho*, *Tolesbury*, and *Salt-coaſe*, and "there throw them into the Channel, which they "call their Beds or Layers, where they grow and fat-"ten, and in two or three years the ſmalleſt Brood "will be *Oyſters* of the ſize aforeſaid.

"Thoſe *Oyſters* which they would have green, "they put into Pits about three foot deep, in the "Salt-Marſhes, which are overflowed only at Spring-"tides, to which they have Sluces, and let out the "Salt-water until it is about a foot and half deep.

"Theſe Pits from ſome quality in the Soil coope-"rating with the heat of the Sun, will become green, "and communicate their colour to the *Oyſters* that "are put into them in four or five days, though they "commonly let them continue there ſix Weeks, or "two Months, in which time they will be of a dark "green.

"To prove that the Sun operates in the greening, "*Tolesbury* Pits will green only in Summer; but that "the

"the Earth hath the greater power, *Brickel-ſea* Pits "green both Winter and Summer: and for a further "proof, a Pit within a foot of a greening Pit will not "green; and thoſe that did green very well, will in "time loſe their quality.

"The *Oyſters* when the Tide comes in lie with their "hollow ſhell downwards, and when it goes out they "turn on the other ſide; they remove not from their "place unleſs in cold weather, to cover themſelves in "the Ouſe.

"The reaſon of the ſcarcity of *Oyſters*, and conſe-"quently of their dearneſs, is, becauſe they are of "late years bought up by the *Dutch*.

"There are great penalties by the Admiralty-"Court, laid upon thoſe that fiſh out of thoſe grounds "which the Court appoints, or that deſtroy the "Cultch, or that take any *Oyſters* that are not of "ſize, or that do not tread under their feet, or throw "upon the ſhore, a Fiſh which they call a *Five finger*, "reſembling a Spur-rowel, becauſe that Fiſh gets in-"to the *Oyſters* when they gape, and ſucks them out.

"The reaſon why ſuch a penalty is ſet upon any "that ſhall deſtroy the Cultch, is becauſe they find "that if that be taken away the Ouſe will increaſe, "and then *Muſcles* and *Cockles* will breed there, and "deſtroy the *Oyſters*, they having not whereon to "ſtick their Spat.

"The *Oyſters* are ſick after they have Spat; but in "*June* and *July* they begin to mend, and in *Auguſt* they "are perfectly well: The Male-*Oyſter* is black-ſick, "having a black ſubſtance in the Fin; the Female "white-ſick (as they term it) having a milky ſubſtance "in the Fin. They are ſalt in the Pits, ſalter in the "Layers, but ſalteſt at Sea.

In

In Compoſing *Hiſtories* after this manner, they reſolve to proceed, till they have not only obtain'd an *Account* of all the Great, and moſt ſubſtantial *Trades*; but alſo of all the leſs *Works*, and Private *Productions*, which are confin'd to ſome particular *Soyls*, or *Corporations*, or *Families*. As this Stock ſhall increaſe, they purpoſe to make it of General uſe; either by continual *Printing* the moſt remarkable of them, or by freely expoſing them to the view of all, that deſire ſuch *Informations*; provided, that at the ſame time they receive ſome, they will alſo Communicate others: And they have aſſured grounds of *confidence*, that when this *attempt* ſhall be compleated, it will be found to bring innumerable benefits to all practical *Arts*: When all the ſecrets of *Manufactures* ſhall be ſo diſcover'd, their *Materials* deſcrib'd, their *Inſtruments* figur'd, their *Products* repreſented: It will ſoon be determin'd, how far they themſelves may be promoted, and what new conſequences may thence be deduc'd. Hereby we ſhall ſee whether all the parts of the moſt obvious *Crafts* have been brought to perfection; and whether they may not aſſiſt each other, more than has been hitherto indeavour'd: Hereby we ſhall diſcern the compaſs, the power, the changes, the degrees, the ages of them all; and ſpeedily underſtand, whether their effects have been large enough, and the wayes of producing them ſufficiently compendious. In ſhort, by this help the worſt *Artificers* will be well inſtructed, by conſidering the *Methods*, and *Tools* of the beſt: And the greateſt *Inventors* will be exceedingly inlighten'd; becauſe they will have in their view the labours of many men, many places, and many times, wherewith to compare their own. This is the ſureſt, and moſt

moſt effectual means, to inlarge the *Invention*: whoſe Nature is ſuch, that it is apt to increaſe, not only by mens beholding the *Works* of greater, but of equal, nay of leſs Wits than themſelves.

In the whole progreſs of this *Narration*, I have been cautious to forbear Commending the labours of any Private *Fellows* of the *Society*. For this, I need not make any *Apology* to them; ſeeing it would have been an inconſiderable Honour, to be prais'd by ſo mean a Writer: But now I muſt break this *Law*, in the particular caſe of Dr. *Chriſtopher Wren*: For doing ſo, I will not alledge the excuſe of my *Friendſhip* to him; though *that* perhaps were ſufficient; and it might well be allow'd me to take this occaſion of Publiſhing it: But I only do it on the meer conſideration of Juſtice: For in turning over the *Regiſters* of the *Society*, I perceiv'd that many excellent things, whoſe firſt *Invention* ought to be aſcrib'd to him, were caſually omitted: This moves me to do him right by himſelf, and to give this ſeparate Account of his indeavours, in promoting the Deſign of the *Royal Society*, in the ſmall time wherein he has had the opportunity of attending it. Sect. XI. *The Concluſion of this Part.*

The firſt inſtance I ſhall mention, to which he may lay peculiar claim, is the *Doctrine of Motion*, which is the moſt conſiderable of all others, for eſtabliſhing the firſt *Principles* of *Philoſophy*, by *Geometrical Demonſtrations*. This *Des Cartes* had before begun, having taken up ſome *Experiments* of this kind upon Conjecture, and made them the firſt *Foundation* of his whole *Syſteme* of *Nature*: But ſome of his Concluſions ſeeming very queſtionable, becauſe they were only deriv'd from the groſs Trials of Balls meeting

meeting one another at *Tennis*, and *Billiards*: Dr. *Wren* produc'd before the *Society*, an *Inſtrument* to repreſent the effects of all ſorts of *Impulſes*, made between two hard globous Bodies, either of equal, or of different bigneſs, and ſwiftneſs, following or meeting each other, or the one moving, the other at reſt. From theſe varieties aroſe many unexpected effects; of all which he demonſtrated the true *Theories*, after they had been confirm'd by many hundreds of *Experiments* in that *Inſtrument*. Theſe he propos'd as the Principles of all *Demonſtrations* in *Natural Philoſophy*: Nor can it ſeem ſtrange, that theſe *Elements* ſhould be of ſuch Univerſal uſe; if we conſider that *Generation*, *Corruption*, *Alteration*, and all the Viciſſitudes of *Nature*, are nothing elſe but the effects ariſing from the meeting of little Bodies, of differing Figures, Magnitudes, and Velocities.

The Second *Work* which he has advanc'd, is the *Hiſtory* of *Seaſons*: which will be of admirable benefit to Mankind, if it ſhall be conſtantly purſued, and deriv'd down to *Poſterity*. His propoſal therefore was, to comprehend a *Diary* of Wind, Weather, and other conditions of the *Air*, as to Heat, Cold, and Weight; and alſo a *General Deſcription* of the Year, whether contagious or healthful to Men or Beaſts; with an Account of *Epidemical Diſeaſes*, of Blaſts, Mill-dews, and other accidents, belonging to Grain, Cattle, Fiſh, Fowl, and Inſects. And becauſe the difficulty of a conſtant *Obſervation* of the *Air*, by Night, and Day ſeem'd invincible, he therefore devis'd a *Clock* to be annex'd to a Weather-Cock, which mov'd a rundle, cover'd with Paper, upon which the Clock mov'd a black-lead-Penſil; ſo that the Obſerver by the Traces of the Pencil on the

the Paper, might certainly conclude, what Winds had blown in his abſence, for twelve hours ſpace: After a like manner he contriv'd a *Thermometer* to be its own *Regiſter*: And becauſe the uſual *Thermometers* were not found to give a true meaſure of the extention of the *Air*, by reaſon that the accidental gravity of the liquor, as it lay higher or lower in the Glaſs, weigh'd unequally on the *Air*, and gave it a farther contraction or extenſion, over and above that which was produc'd by heat and cold; therefore he invented a *Circular Thermometer*, in which the liquor occaſions no fallacy, but remains alwayes in one height moving the whole *Inſtrument*, like a Wheel on its *Axis*.

He has contriv'd an *Inſtrument* to meaſure the quantities of *Rain* that falls: This as ſoon as it is full, will pour out it ſelf, and at the years end diſcover how much Rain has fallen on ſuch a ſpace of Land, or other hard ſuperficies, in order to the *Theory* of *Vapours*, *Rivers*, *Seas*, &c.

He has devis'd many ſubtil wayes for the eaſier finding the gravity of the *Atmoſphere*, the degrees of drought and moyſture, and many of its other accidents. Amongſt theſe *Inſtruments* there are *Balances* which are uſefull to other purpoſes, that ſhew the weight of the *Air* by their ſpontaneous inclination.

Amongſt the new Diſcoveries of the *Pendulum*, theſe are to be attributed to him, that the *Pendulum* in its motion from reſt to reſt; that is, in one deſcent and aſcent, moves unequally in equal times, according to a line of ſines: That it would continue to move either in *Circular*, or *Eliptical* Motions; and ſuch *Vibrations* would have the ſame Periods with thoſe that are reciprocal; and that by a complication

of ſeveral *Pendulums* depending one upon another, there might be repreſented motions like the Planetary *Helical Motions*, or more intricate: And yet that theſe *Pendulums* would diſcover without confuſion (as the *Planets* do) three or four ſeveral *Motions*, acting upon one Body with differing *Periods*; and that there may be produc'd a Natural Standard for Meaſure from the *Pendulum* for vulgar uſe.

He has invented many ways to make *Aſtronomical Obſervations* more acurate and eaſie: *He* has fitted and hung *Quadrants*, *Sextants*, and *Radii*, more commodiouſly than formerly: *He* has made two *Teleſcopes*, to open with a joynt like a Sector, by which Obſervers may infallibly take a diſtance to half minutes, and find no difference in the ſame Obſervation reiterated ſeveral times; nor can any warping or luxation of the Inſtrument hinder the truth of it.

He has added many ſorts of *Retes*, *Screws*, and other deviſes to *Teleſcopes*, for taking ſmall diſtances and apparent diamets to Seconds. He has made apertures to take in more or leſs light, as the Obſerver pleaſes, by opening and ſhutting like the pupil of the eye, the better to fit Glaſſes to *Crepuſculine Obſervations*: He has added much to the Theory of *Dioptrics*; much to the Manufacture it ſelf of grinding good Glaſſes. *He* has attempted, and not without ſucceſs, the making of Glaſſes of other forms than Spherical. *He* has exactly meaſur'd and delineated the Spheres of the humors in the *Eie*, whoſe proportions one to another were only gheſs'd at before. This accurate diſcuſſion produc'd the reaſon, why we ſee things erected, and that *Reflection* conduces as much to *Viſion* as *Refraction*.

He diſcours'd to them a Natural and eaſie *Theory* of *Refraction*

Refraction, which exactly anſwer'd every *Experiment*. *He* fully demonſtrated all *Dioptrics* in a few Propoſitions, ſhewing not only (as in *Keplers Dioptrics*) the common properties of Glaſſes, but the proportions by which the individual Rayes cut the *Axis*, and each other; upon which the Charges (as they are uſually called) of *Teleſcopes*, or the proportion of the Eye-glaſſes and *Apertures* are demonſtrably diſcover'd.

He has made conſtant Obſervations on *Saturn*; and a Theory of that Planet, truly anſwering all *Obſervations*, before the printed Diſcourſe of *Hugonius* on that ſubject appear'd.

He has eſſay'd to make a true *Selenography* by meaſure; the *world* having nothing yet but pictures, rather than Surveighs or Maps of the *Moon*. *He* has ſtated the *Theory* of the Moons Libration, as far as his *Obſervations* could carry him. *He* has compos'd a *Lunar Globe*, repreſenting not only the ſpots, and various degrees of whiteneſs upon the ſurface, but the hills, eminencies, and cavities moulded in ſolid work. The Globe thus faſhioned into a true model of the Moon, as you turn it to the light repreſents all the Menſtrual phaſes, with the variety of appearances that happen from the ſhadows of the Mountains and Valleys. *He* has made Maps of the *Pleiades*, and other *Teleſcopical* Stars; and propos'd Methods to determine the great doubt of the Earths motion or reſt, by the ſmall Stars about the Pole to be ſeen in large *Teleſcopes*.

In order to *Navigation he* has carefully purſu'd many *Magnetical Experiments*; of which this is one of the nobleſt and moſt fruitful of *Speculation*. A large *Terella* is plac'd in the midſt of a Plane Board, with a hole in-

to which the *Terella* is half immers'd, till it be like a *Globe*, with the *Poles* in the *Horizon*. Then is the Plane duſted over with ſteel-filings equally from a Sieve: The Duſt by the *Magnetical* virtue is immediatly figur'd into Furrows, that bend like a ſort of *Helix*, proceeding as it were out of one *Pole*, and returning into the other: And the whole Plane is thus figur'd like the Circles of a *Planiſphere*.

It being a Queſtion amongſt the Problems of *Navigation*, very well worth reſolving, to what Mechanical powrs the Sailing (againſt the wind eſpecially) was reducible; he ſhew'd it to be a Wedge: And he demonſtrated how a tranſient Force upon an oblique Plane, would cauſe the motion of the Plane againſt the firſt Mover. And he made an *Inſtrument*, that *Mechanically* produc'd the ſame effect, and ſhew'd the reaſon of Sayling to all Winds.

The *Geometrical Mechanics* of *Rowing*, he ſhew'd to be a *Vectis* on a moving or cedent *Fulcrum*. For this end he made *Inſtruments*, to find what the expanſion of Body was towards the hindrance of Motion in a Liquid *Medium*; and what degree of impediment was produc'd, by what degree of expanſion: with other things that are the neceſſary Elements for laying down the *Geometry* of *Sailing*, *Swimming*, *Rowing*, *Flying*, and the Fabricks of *Ships*.

He has invented a very curious and exceeding ſpeedy way of *Etching*. *He* has ſtarted ſeveral things towards the emendation of *Water-works*. *He* has made *Inſtruments* of *Reſpiration*, and for ſtraining the breath from fuliginous vapours, to try whether the ſame breath ſo purify'd will ſerve again.

He was the firſt *Inventor* of drawing Pictures by *Microſcopical Glaſſes*. *He* has found out perpetual, at leaſt

leaſt long-liv'd Lamps, and Regiſters of Furnaces, and the like, for keeping a perpetual temper, in order to various uſes; as hatching of Eggs, Inſects, production of Plants, Chymical Præparations, imitating Nature in producing Foſſils and Minerals, keeping the motion of Watches equal, in order to *Longitudes* and *Aſtronomical uſes*, and infinite other advantages.

He was the firſt Author of the Noble *Anatomical Experiment* of *Injecting Liquors into the Veins of Animals.* An *Experiment* now vulgarly known; but long ſince exhibited to the Meetings at *Oxford*, and thence carried by ſome *Germans*, and publiſh'd abroad. By this *Operation* divers Creatures were immediately purg'd, vomited, intoxicated, kill'd, or reviv'd, according to the quality of the Liquor injected: Hence aroſe many new *Experiments*, and chiefly that of *Transfuſing Blood*, which the *Society* has proſecuted in ſundry Inſtances, that will probably end in extraordinary Succeſs.

This is a ſhort account of the Principal *Diſcoveries* which Dr. *Wren* has preſented or ſuggeſted to this *Aſſembly.* I know very well, that ſome of them *he* did only ſtart and deſign; and that they have been ſince carry'd on to perfection, by the Induſtry of other hands. I purpoſe not to rob them of their ſhare in the honour: Yet it is but reaſonable, that the original *Invention* ſhould be aſcrib'd to the true *Author*, rather than the *Finiſhers.* Nor do I fear that this will be thought too much, which I have ſaid concerning him: For there is a peculiar reverence due to ſo much excellence cover'd with ſo much modeſty. And it is not Flattery but honeſty, to give him his juſt praiſe; who is ſo far from uſurping the fame of other men, that

that he indeavours with all care to conceal his own.

I have now perform'd my *Promiſe*, and drawn out of the Papers of the *Society*, an *Epitome* of the chief *Works* they have conceiv'd in their minds, or reduc'd into Practice. If any ſhall yet think they have not uſefully employ'd their time, I ſhall be apt to ſuſpect, that they underſtand not what is meant by a *diligent* and *profitable labouring* about *Nature*. There are indeed ſome men who will ſtill condemn them for being idle; unleſs they immediately profeſs to have found out the Squaring of the Circle, or the *Philoſophers Stone*, or ſome other ſuch mighty *Nothings*. But if theſe are not ſatisfied with what the *Society* has done, they are only to blame the extravagance of their own Expectations. I confeſs I cannot boaſt of ſuch pompous *Diſcoveries*: They promiſe no Wonders, nor endeavour after them: Their Progreſs has been equal, and firm, by Natural degrees, and thorow ſmall things, as well as great: They go leiſurably on; but their ſlowneſs is not caus'd by their idleneſs, but care. They have contriv'd in their thoughts, and couragiouſly begun an *Attempt*, which all *Ages* had deſpair'd of. It is therefore fit that they alone, and not others, who refuſe to partake of their burden, ſhould be Judges by what ſteps, and what pace, they ought to proceed.

Such men are then to be intreated not to interrupt their *Labors* with impertinent rebukes; they are to remember, that the *Subject* of their *Studies* is as large as the *Univers*: and that in ſo vaſt an *Enterpriſe*, many intervals and diſappointments muſt be recon'd upon. Though they do not behold that the *Society* has already fill'd the world with *perfect Sciences*; yet

yet they are to be inform'd, that the nature of their *Work* requir'd that they ſhould firſt begin with *immethodical Collections* and *indigeſted Experiments*, before they go on to finiſh and compoſe them into *Arts*. In which Method they may well be juſtified, ſeeing they have the *Almighty Creator* himſelf for an *Example*: For he at firſt produc'd a confus'd and ſcatter'd Light; and reſerv'd it to be the *work* of another day, to gather and faſhion it into beautiful *Bodies*.

The End of the Second Part.

THE HISTORY OF THE ROYAL SOCIETY.

The THIRD PART.

THough it be certain, that the promoting of *Experiments* according to this *Idæa*, cannot injure the Virtue, or Wiſdom of Mens minds, or their former *Arts*, and Mechanical Practices; or their eſtabliſh'd wayes of life: Yet the perfect innocence of this deſign, has not been able to free it from the Cavill of the *Idle*, and the *Malicious*; nor from the jealouſies of Private Intereſts. Theſe groundleſs prejudices of the particular *Profeſſions*, and *Ranks* of Men, I am now in the Laſt place to remove; and to ſhew that there is no Foundation for them: To ſuſpect the *Change*, which can be made by this *Inſtitution*; or the new things it it likely to produce. Sect. I. *The Subject and Diviſion of this Third Part.*

That it will probably be the Original of many *new things*, I am ſo far from denying, that I chearfully acknowledge it. Nor am I frighted at that, which is wont to be objected in this Caſe, the hazard of *alteration*, and *Novelty*. For if all things that are

new be *deſtructive*, all the ſeveral means, and degrees, by which Mankind has riſen to this perfection of *Arts*, were to be condemn'd. If to be the *Author* of *new things*, be a crime; how will the firſt Civilizers of *Men*, and makers of *Laws*, and Founders of *Governments* eſcape? Whatever now delights us in the Works of *Nature*, that excells the rudeneſs of the firſt Creation, is *New*. Whatever we ſee in Cities, or Houſes, above the firſt wildneſs of Fields, and meaneſs of Cottages, and nakedneſs of Men, had its time, when this imputation of *Novelty*, might as well have bin laid to its charge. It is not therefore an offence, to profeſs the introduction of *New things*, unleſs that which is introduc'd prove pernicious in itſelf; or cannot be brought in, without the extirpation of others, that are better.

And that *Experimental Knowledge*, will not expoſe us to theſe dangers, I am next to declare, in a Univerſal *Apology* for its intentions, and effects. This was the Third Portion, which I at firſt reſerv'd, for the Concluſion of my Diſcourſe. Yet caſting my eyes back, I find, that I have already on ſeveral occaſions prevented my ſelf; and ſaid many things as I came along, which would have bin more proper for this place. But I deſire that my Reader would interpret this to have proceeded from the Nature of my Subject, of which it is hard to Write a plain *Hiſtory*, without falling ſometimes unawares into its *Praiſe*. And now I will proceed to a fuller, and more ſolemn *Defence*: In which, I will try to prove, that the increaſe of *Experiments* will be ſo far from hurting, that it will be many waies advantageous, above other *Studies*, to the wonted Courſes of *Education*; to the Principles, and inſtruction of the minds of men.

Men in general; to the *Chriſtian Religion*, to the Church of *England*; to all Manual *Trades*; to *Phyſic*; to the *Nobility*, and *Gentry*; and the Univerſal Intereſt of the whole *Kingdom*.

In all which *Particulars*, I hope I ſhall repreſent this *Model*, to be inoffenſive to all the various wayes of Living, already in uſe: and thereby I ſhall ſecure all the Ancient *Proprietors* in their *Rights*: A work as neceſſary to be done, in raiſing a *new Philoſophy* as we ſee it is in building a *new London*.

Sect. II. *Experiments will not injure Education.*

The Firſt prejudice I am to wipe away, concerns the uſual wayes of *Education*. For it is an obvious doubt; whether ſo great a change in *Works*, and *Opinions*, may not have ſome fatal conſequence, on all the former Methods of *Teaching*, which have bin long ſetled, and approv'd by much Cuſtom. And here many Good Men of ſevere, and ancient manners, may ſeem to have reaſon, when they urge againſt us; that the Courſes of Trayning up of Youth, ought to be ſtill the ſame; that if they be ſubverted, or multiply'd, much confuſion will follow; and that this our *Univerſal Inquiry* into things hitherto unqueſtion'd, can never be made, without diſturbing ſuch eſtabliſh'd *Rules* of *Diſcipline*, and *Inſtruction*.

For a *General Anſwer* to this, it might ſuffice to declare, that in this *Inſtitution*, Men are not ingag'd in theſe *Studies*, till the Courſe of *Education* be fully compleated: that the *Art* of *Experiments*, is not thruſt into the hands of Boyes, or ſet up to be perform'd by Beginners in the School; but in an Aſſembly of Men of Ripe years: who while they begin a *new Method* of Knowledge, which ſhall conſiſt of *Works*, and is therefore moſt proper for Men:

they ſtill leave to Learners, and Children, the old talkative *Arts* which beſt fit the younger Age. From hence it muſt follow, that all the various manners of *Education*, will remain undiſturb'd; becauſe the practiſes of them, and the labors of this, are not appointed to meet in the ſame *Age*, or *Perſons*. But if this will not ſatisfy our *Adverſaries*, let us proceed to conſider the different Parts of *Education*: and then we ſhall be able to make the ſurer Conjectures, what manner of Influence, *new Experiments* will have upon it.

Education Conſiſts in divers Rules, and Practiſes, whereby men are furniſh'd for all the ſeveral Courſes of Life, to which they may apply themſelves. Of theſe præparatory *Arts*, ſome concern the *Body*, ſome the *Mind*. Thoſe of the *Body* have no relation to my preſent *Argument*: Of thoſe of the *Mind*, ſome intend the purity, and Ornament of *Speech*: Some the Knowledge of the Actions of former, and preſent *Times*: Some the Government, and Virtu of our Lives: Some the *Method* of reaſoning: Some the ſkill in the motions and meaſures of the *Hevens*, and the *Earth*, and all this great Frame of *Viſible* things.

Grammar, and Rhetoric.

Firſt then I will make no ſcruple to acquit *Experimental Philoſophy*, from having any ill effects, on the uſual *Arts*, whereby we are taught the Purity, and Elegance of *Languages*. Whatever diſcoveries ſhall appear to us afreſh, out of the hidden things of *Nature*, the ſame words, and the ſame waies of Expreſſion will remain. Or if perhaps by this means, any change ſhall be made herein; it can be only for the better; by ſupplying mens Tongues, with very many *new things*, to be nam'd, and adorn'd, and deſcrib'd in their diſcourſe. Nor

Nor can there be any more jealouſie concerning the *Moral*, and *Political* Rules of ordering mens lives. But they may ſtill have the ſame influence, and authority, and may be propos'd to our imitation, by the ſame præcepts, and arguments, of perſuaſion. *Moral Philoſophy.*

It is alſo as manifeſt, that the *Art* of teaching the *Actions* of former Ages; can from hence receive no dammage, or alteration. This cannot be otherwiſe; ſeeing the Subjects of *Natural*, and *Civil Hiſtory* do not croſs each other; nor does the *New Philoſophy* of Nature more interfere, with the *Hiſtorys* of *Men*, and *Government*, than the *Old*, of which this doubt was never rays'd. *Hiſtory.*

Thus far then we are ſecure. Theſe great, and fundamental Parts of *Education*, the Inſtruments of mens Expreſſing, and Ruling their own minds, and ſearching into the Actions of others, will be unalter'd, whatever new changes of Opinions may ariſe about *Natural Things*. Let us next go on to conſider the *Arts* of *Demonſtration*, and *Argumentation*, in which conſiſts one of the moſt weighty Parts of youthful Studies.

Firſt for all the *Mathematical Sciences*, they will ſtill remain the ſame, and ſtill continue to be learn'd, and taught, in the ſame *Syſtemes*, and *Methods* as before. Nothing that can now be diſcover'd will ſubvert, but rather Confirm what is already well-built on thoſe immoveable principles. As they came down to us without detriment, through all the corrupt Times of *Learning*; ſo they will certainly now continue uncorrupt, at this preſent, when *Learning* is reſtor'd. *The Mathematics.*

reſtor'd. Seing they could not be deſtroy'd in the *Ignorant Ages*, they will be in no fear, at this time, by this *Inſtitution*, which deſigns not only to inlarge them, but to promote the ſame rigid way of *Concluſion* in all other *Natural things*, which only the *Mathematics* have hitherto maintaind.

Metaphyſcis and Logic. Now then, this whole controverſy is reduc'd to the alteration, which the *Logic*, and *phyſics* of the Ancients, may receive by this change. As for their *Metaphyſics*, they ſcarce deſerve to have a place allow'd them in this conſideration.

Nor does that prevail with mee, which the Lovers of that *Cloudy Knowledge* are wont to boaſt, that it is an excellent inſtrument to refine, and make ſubtil the minds of men. For there may be a greater Exceſs in the ſubtilty of mens wits, than in their thickneſs: as we ſee thoſe threads, which are of too fine a ſpinning, are found to be more uſeleſs, than thoſe which are homeſpun, and groſs.

Logic is the *Art* of *Conceiving*, *Arguing*, and *Method*. And notwithſtanding all the progreſs which may happen in *Natural Knowledge*, all the ſeveral parts of Reas'ning, which it teaches in all manner of buſineſs, will continue the ſame. The operations, and powers of the *mind* will ſtill be the ſame: they will ſtill be ſubject to the ſame errors: they will ſtill uſe the ſame degrees of Arguing from particular things, to *propoſitions*, and *concluſions*; and therefore they will ſtill require the ſame means, and exerciſes for *direction*. It is not the complaint of the promoters of *Experiments*, that men have bin wanting to themſelves, in regulating, diſpoſing, or judging of their own *thoughts*. Nay they rather condemn them, for being wholy imployd

imployd about the *productions* of their own *minds*, and neglecting all the works of *Nature*, that are without them. It cannot therefore be ſuſpected that theſe *Inquiſitive Men*, ſhould buſy themſelves, about altering the *Art of Diſcours*, wherin they judge that mankind has bin already rather too Curious, than negligent.

The Laſt part that I ſhall mention, of the *Learning* that is taught, is the *Syſteme* of *Natural Philoſophy*. And it is in this alone, that I can allow, there will be any alteration made, by this reformation of *Knowledge*. But yet the change will be ſo advantageous, that I have no reaſon to diſſemble it. I grant indeed that the greateſt part of the former Body of *Phyſics*, may hereby chance to fall to the ground. But to what ſum will the dammage amount? What can we loſe, but only ſome few *definitions*, and idle *queſtions*, and empty *diſputations*? Of which I may ſay as one did of *Metaphors*, *Poterimus vivere ſine illis*. Perhaps there will be no more uſe of Twenty, or Thirty obſcure Terms, ſuch as *Matter*, and *Form*, *Privation*, *Entelichia*, and the like. But to ſupply their want, and infinit variety of *Inventions*, *Motions*, and *Operations*, will ſucceed in the place of words. The Beautiful Boſom of *Nature* will be Expos'd to our view: we ſhall enter into its *Garden*, and taſt of its *Fruits*, and ſatisfy our ſelves with its *plenty*: inſteed of Idle talking, and wandring, under its fruitleſs ſhadows; as the *Peripatetics* did in their firſt inſtitution, and their Succeſſors have done ever ſince. *Natural Philoſophy.*

Thus

Sect. III. *Experiments not dangerous to the Universities.*

Thus far I have briefly examin'd the influence of *new Experiments*, or all the chief Parts of *Education*. And after all the *Innovation*, of which they can be suſpected, we find nothing will be indanger'd, but only the *phyſics* of *Antiquity*: wherein we alſo behold, that many things of greater concernment, will ariſe, to ſupply the place of what ſhall be cut away. By this diſcours, I hope, I have ſaid enough, to manifeſt the innocence of this *Deſign* in reſpect of all the preſent *Schools of Learning*; and eſpecially our own *Univerſities*. And it was but juſt, that we ſhould have this *tenderneſs*, for the Intereſt of thoſe magnificent *Seats* of *humane Knowledge*, and *divine*; to which the *Natural Philoſophy* of our Nation, cannot be injurious without horrible *ingratitude*; ſeeing in them it has been principally cheriſh'd, and reviv'd. From thence the greateſt part of our *Modern Inventions* have deduc'd their *Original*. It is true ſuch *Experimental Studies* are largely diſpers'd at this time: But they firſt came forth thence, as the *Colonies* of old did from *Rome*: and therefore as thoſe did, they ſhould rather intend the ſtrength, than the deſtruction of their *Mother-Cities*.

I confeſs there have not bin wanting ſome forward *Aſſertors* of *new Philoſophy*, who have not us'd any kind of *Moderation* towards them: But have preſently concluded, that nothing can be well-done in *new Diſcoveries*, unleſs all the *Ancient Arts* be firſt rejected; and their Nurſeries aboliſh'd. But the raſhneſs of theſe mens proceedings, has rather prejudic'd, than advanc'd, what they make ſhew to promote. They have come as furiouſly to the purging of *Philoſophy*, as our *Modern Zealots* did to the *Reformation*

reformation of *Religion*. And the one Party is as juſtly to be condem'd, as the other. Nothing will ſuffice either of them, but an utter *Deſtruction*, *Root* and *Branch*, of whatever has the face of *Antiquity*. But as the *Univerſities* have withſtood the fierceneſs of the ones zeal without knowledge; ſo there is no doubt, but they will alſo prevail againſt the violence of the others pretences to *knowledge* without *prudence*.

Sect. IV. *The advantage of an Experimental Education.*

But now after I have ſhewn that all the receiv'd forms of *Education* will be ſafe, I ſhall make no ſcruple to add my *conjecture*, that it could be no hindrance to the *minds* of men, if beſides thoſe courſes of Studies which are now follow'd, there were alſo trial made of ſome other more practical ways, to prepare their *minds* for the world, and the buſineſſes of human life. It is not enough to urge againſt this, that the multiplicity of *Methods* would hinder and confound the Spirits of young men; for it is apparent that nothing more ſuppreſſes the *Genius* of *Learners*, than the *formality*, and the *confinement* of the Precepts, by which they are inſtructed. To this purpoſe I will venture to propoſe to the *conſideration* of wiſe men, whether this way of *Teaching* by *Practiſe* and *Experiments*, would not at leaſt be as beneficial, as the other by *Univerſal Rules*? Whether it were not as profitable to apply the eyes, and the hands of Children, to ſee, and to touch all the ſeveral kinds of *ſenſible things*, as to oblige them to learn, and remember the difficult *Doctrines* of general *Arts*? In a word, Whether a *Mechanical Education* would not excel the *Methodical*?

This certainly is no new device: For it was that

which *Plato* intended, when he injoin'd his *Scholars* to begin with *Geometry*; whereby, without queſtion, he deſign'd, that his *Diſciples* ſhould firſt handle *Material Things*, and grow familiar to viſible Objects, before they enter'd on the retir'd *Speculations* of other more abſtracted *Sciences*.

According to this counſail of the *Father* of *Philoſophers*, it would not be amiſs, if before yong Scholars be far ingag'd in the beaten tracks of the Scholes, the Myſteries of *Manual Arts*, the names of their *Inſtruments*, the ſecrets of their *Operations*, the effects of Natural cauſes, the ſeveral kinds of *Beaſts*, of *Birds*, of *Fiſhes*, of *Plants*, of *Stones*, of *Minerals*, of *Earths*, of *Waters*, and all their common Virtues and Qualities, were propos'd to be the ſubjects of their firſt thoughts and obſervations. It may be here ſuggeſted, That the vaſt number of ſuch particulars will ſoon overwhelm their tender minds, before they are well eſtabliſh'd by time, and uſe. But on the contrary it is evident, that the *Memories* of *Youth* are fitter to retain ſuch ſenſible images, than thoſe of a fuller age. It is *Memory* that has moſt vigour in Children, and *Judgment* in Men: which if rightly conſider'd, will confirm what I ſaid, that perhaps we take a præpoſterous cours in *Education*, by teaching *General Rules*, before *Particular Things*: and that therein we have not a ſufficient Regard, to the different advantages of *Youth* and *Manhood*. We load the minds of Children with Doctrines, and Præcepts, to apprehend which they are moſt unfit, by reaſon of the weakneſs of their underſtandings; wheras they might with more profit be exercis'd in the conſideration of *viſible* and *ſenſible things*; of whoſe impreſſions they are moſt capable, becauſe of the ſtrength

of

of their *Memories*, and the perfection of their *Senſes*.

The firſt years of men being thus freed from any apprehenſions of miſchief by new *Experiments*: I will now proceed more boldly to bring them in amidſt the Throngs, and Crowds of human buſineſs; and to declare to all Profeſſions, and practical Lives, that they can receive no ill impreſſions from them, but that they will be the moſt beneficial and proper *Studies*, for their præparation and direction. And to this purpoſe, I will treat of their uſefulneſs, both in reſpect of mens public practiſe, and the privat government of their own minds. Sect. V. *The uſe of Experiments to a practical Life.*

As to the firſt, it has bin an old complaint, that has bin long manag'd by men of buſineſs, againſt many ſorts of *Knowledge*, that our thoughts are thereby infected with ſuch conceptions, as make them more unfit for action, than they would have bin, if they were wholly left to the force of their own *Nature*. The common Accuſations againſt *Learning* are ſuch as theſe; That it inclines men to be unſetled, and *contentious*; That it takes up more of their time, than men of buſineſs ought to beſtow; That it makes them *Romantic*, and ſubject to frame more perfect images of things, than the things themſelves will bear; That it renders them overweening, unchangeable, and obſtinat; That thereby men become averſe from a practical cours, and unable to bear the difficulties of action; That it emploies them about things, which are no where in uſe in the world; and, That it draws them to neglect and contemn their own preſent times, by doting on the paſt. But now I will maintain, that in every one of theſe dangers *Experimental Know-* *Experiments free from the faults of other ſorts of Learning.*

ledge is leſs to be ſuſpected than any other; That in moſt of them (if not all) it is abſolutely innocent; nay, That it contains the beſt remedies for the diſtempers which ſome other ſorts of Learning are thought to bring with them.

Sect. VI. *The firſt objection againſt Learning, That it makes men too diſputative.*

The firſt *Objection* againſt *Knowledge*, of which I ſhall take notice in the active part of life is this, That it makes men too plentiful in their *thoughts*; too inventive, and cavilling in their *Arguments*; and ſo rather teaches them to be witty in *objecting*, than ready in *reſolving*, and diligent in *performing*. I confeſs the Ancient *Philoſophy* will hardly be able to vindicate it ſelf from this charge: For its chief purpoſe is to enlarge the fancy, and to fill the head with the matter and artifice of diſcours. But this cannot any way touch the *Art* of *Experiments*. That conſiſts not in *Topicks* of reas'ning, but of working: That indeed is full of doubting and inquiry, and will ſcarce be brought to ſettle its aſſent: But it is ſuch a doubting as proceeds on *Trials*, and not on *Arguments*. That does neither practiſe nor cheriſh this humor of diſputing, which Breaks the force of things by the ſubtilty of words; as *Seneca* was ſaid to do by his ſtyle: It weakens mens arms, and ſlackens all the ſinews of action: For ſo it commonly happens, that ſuch earneſt diſputers evaporate all the ſtrength of their minds in arguing, queſtioning, and debating; and tire themſelves out before they come to the *Practiſe*.

Sect. VII. *The ſecond, That it takes up too much time.*

The next accuſation is, That ſo many intricate paths, and ſpacious windings of *Learning*, will require more time than can be ſpar'd by men of active and buſy

buſy lives. The belief of this has always made a wide divorce between men of *knowledge* and *action*; while both have thought, that they muſt either be wholly *Scholars*, or wholly men of *buſineſs*; and that an excellence in both theſe courſes can never be obtain'd by human wit. 'Tis true indeed, there is no *Knowledge* or *Science* that can be acquitted from being too large, if their *Profeſſors* have not the diſcretion to know how far to proceed, and what moderation is to be us'd in every *Study*. There is in the leaſt *Art* enough matter, about which if men ſhall reſolve to trouble their brains all their lives, one *queſtion* and *difficulty* will perpetually beget another, and ſo (as one of the *Ancients* ſayes) *Ipſa tractatio, & queſtio quotidiè ex ſe gignet aliquid, quod cum deſidioſâ delectatione veſtiges.*

To this danger perhaps *Experiments* may ſeem moſt expos'd, by reaſon of the infinit multitude of particulars, and innumerable variations of inquiries, that may be made. But the *Royal Society* has prevented this miſchief, by the number and ſucceſſion of thoſe that ſhall undertake the *work*. They require not the whole time of any of their *Members*, except only of their *Curators*: From the reſt they expect no more but what their *buſineſs*, nay even their very *recreations* can ſpare. It is the continuance and perpetuity of ſuch *Philoſophical labours*, to which they principally truſt; which will both allow a ſufficient relaxation to all the particular *laborers*, and will alſo give good aſſurance of the happy iſſue of their *work* at the laſt: For though that be true, which the Great Phyſician laments, *That Art is long, and Life is ſhort*; yet many Lives of ſtudious and induſtrious men in one *Age*, and the ſucceſſion of many Lives of ſuch men in all future

future *Ages*, will undoubtedly prove as long as *Art* it ſelf.

Sect. VIII. *The third objection, That it makes our minds Romantic.*

They farther object againſt *Learning*, That it makes our minds too *lofty* and *Romantic*, and inclines them to form more perfect imaginations of the matters we are to practiſe, than the matters themſelves will bear. I cannot deny, but a meer contemplative man is obnoxious to this error: He converſes chiefly in his Cloſet, with the heads and notions of things, and ſo diſcerns not their bottoms neer and diſtinctly enough: And thence he is ſubject to overlook the little circumſtances, on which all human actions depend. He is ſtill reducing all things to ſtanding *Doctrines*; and therefore muſt needs be liable to neglect the opportunities, to ſet upon buſineſs too ſoon, or too late; to put thoſe things together in his mind, which have no agreement in *Nature*. But this above all is his greateſt danger, that thinking it ſtill becomes him to go out of the *ordinary way*, and to refine and heighten the conceptions of the vulgar, he will be ready to diſdain all the *Natural* and *eaſy* ways of *Practice*, and to believe that nothing ought to be done, though never ſo common, but by ſome device of *Art*, and trick of unuſual *wiſdome*.

From theſe inconveniences the *Experimenter* is ſecure: He invents not what he does out of himſelf; but gathers it from the footſteps and progreſs of *Nature*. He looks on every thing ſtanding equal to it, and not as from a higher ground: He labors about the plain and undigeſted objects of his ſenſes, without conſidering them as they are joyn'd into common *Notions*. He has an opportunity of underſtanding the moſt natural ways by which all things are produc'd.

duc'd. He cleerly beholds all the ſecret accidents and turnings, advantages and failings of *Nature*. He indevors rather to know, than to admire; and looks upon *admiration*, not as the end, but the imperfection of our *knowledge*.

Sect. IX. *The fourth objection, That it makes men preſumptuous & obſtinate.*

The next hindrance of *Action*, is *an obſtinacy of reſolution*, and a want of *Dexterity*, to change our apprehenſions of things according to occaſions. This is the more deſtructive, becauſe it carries with it the moſt ſolemn appearance of *Wiſdom*. There is ſcarce any thing that renders a man ſo uſeleſs, as a pervers ſticking to the ſame things in *all times*, becauſe he has ſomtimes found them to have bin in ſeaſon. But now in this, there is ſcarce any *compariſon* to be made, between him who is only a *thinking man*, and a *man of experience*. The firſt does commonly eſtabliſh his conſtant Rules, by which he will be guided: The later makes none of his *opinions* irrevocable. The one if he miſtakes, receives his errors from his *Underſtanding*; the other only from his *Senſes*; and ſo he may correct, and alter them with more eaſe. The one fixes his *opinions* as ſoon, the other doubts as long as he can. The one chiefly ſtrives to be unmovable in his mind: The other to enlarge, and amend his *knowledge*: And from hence the one is inclin'd to be *præſumptuous*, the other modeſt in his *judgement*.

Sect. X. *The fifth objection, That its pleaſure draws men off from buſineſs.*

The next pretence, on which men of *Learning* are wont to be vilified, is, that they uſe to be ſo much affected, with the pleaſant muſings of their own thoughts, as to abhor the roughneſs, and toyl of *buſineſs*. This accuſation I confeſs, is not altogether groundleſs. The ſolitary imaginations of *Speculative*

culative Men are of all other the moſt eaſy: there a man meets with little ſtubborneſs of matter: he may chooſe his ſubject where he likes; he may faſhion and turn it as he pleaſes: whereas when he comes abroad into the world, he muſt indure more *contradiction*: more *difficulties* are to be overcome; and he cannot always follow his own *Genius*: ſo that it is not to be wonder'd, that ſo many *great Wits* have deſpis'd the labor of a practical cours; and have rather choſen to ſhut themſelves up from the *noiſe* and *preferments* of the *World*, to convers in the ſhadow with the pleaſant *productions* of their own *fancies*.

And this perhaps is the reaſon why the moſt *extraordinary men* of *Arts* in all Ages, are generally obſerv'd to be the greateſt *Humoriſts*: They are ſo full of the ſweetneſs of their own *conceptions*, that they become moroſe, when they are drawn from them, they cannot eaſily make their minds ductil and pliable to others tempers, and ſo they appear untractable, and unskilful in *converſation*.

From this I ſhall alſo free the *Experimental Philoſopher*. The ſatisfaction that he finds, is not *imaginary*, but *real*: It is drawn from things that are not out of the world, but in it: It does not carry him farther off, but brings him neerer to *Practice*. 'Tis true, that *Knowledge* which is only founded on thoughts and words, has ſeldom any other end, but the *breeding* and *increaſing* of more thoughts and words: But that which is built on *Works* (as his will be) will naturally deſire to diſcover, to augment, to apply, to communicate it ſelf by more *Works*.

Nor can it be thought, that his *mind* will be made to languiſh by this pleaſure of *obſervation*, and to have any averſion from the difficulty and tediouſneſs of

of human affairs; ſeing his way of *obſervation* itſelf is ſo *laborious*. It is a good Precept, which is wont to be given, in reſpect of all ſorts of *Exerciſes*, that they ſhould be at leaſt as hard and toilſom, as that *Art* which we ſtrive to gain by them. And by this rule *Experiments* are an excellent preparation towards any habit or faculty of life whatſoever. For what thing, which can be effected by *mortal Induſtry*, can ſeem impoſſible to him who has been ingag'd in theſe *Studies*, which require ſuch an indefatigable watchfulneſs? What can overcome his diligence, who has bin able to ſuſtain with patience the *eſcapes*, the *delaies*, the *labyrinths* of *Nature*? whom the repetition of ſo many *labors*, ſo many failings, with which he meets, and ſo long attendance could not tire?

Sect. XI. *The ſixth objection, That it makes men regard the times paſt, and neglect the preſent.*

Another Principal miſchief to be avoided, is the conformity of our *Actions* to times paſt, and not the preſent. This extravagance is generally imputed to *ſtudious* men; and they cannot be wholly acquitted from it. For while they continue heaping up in their *Memories* the cuſtoms of paſt *Ages*, they fall inſenſibly to imitate them, without any manner of care *how* ſutable they are to *Times* and *Things*. The grounds of this miſtake will be worth our diſcovering, becauſe in mens opinions it does ſo much prejudice to the learned part of the *World*. In the ancient *Authors* which they turn over, they find deſcriptions of Vertues more perfect than indeed they were: the *Governments* are repreſented better, and the waies of life pleaſanter than they deſerv'd. Upon this, theſe *Bookiſh* wiſe men ſtrait compare what they read with what they ſee: and here beholding nothing ſo heroically tranſcendent, becauſe they are able to mark all

the *ſpots*, as well as *beauties* of every thing, that is ſo cloſe to their ſight, they preſently begin to deſpiſe their own *times*, to exalt the paſt, to contemn the *virtues* and aggravate the *vices* of their *Country*; not indeavoring to amend them, but by ſuch examples as are now unpracticable, by reaſon of the alteration of *Men* and *Manners*.

For this defect, *Experiments* are a ſovereign cure: They give us a perfect ſight of what is before us; they bring us home to our ſelves; they make us live in *England*, and not in *Athens* or *Sparta*; at this preſent time, and not three thouſand years ago: though they permit us to reflect on what has bin done in *former Ages*; yet they make us chiefly to regard and contemplat the things that are in our *view*. This certainly is conformable to the *Deſign* of *Nature* it ſelf; which though it has fram'd our bodies in that manner, that we may eaſily upon occaſion turn about to look behind us; yet it has plac'd the *Eies*, the chief *inſtruments* of *obſervation*, not in our *Backs*, but in our *Foreheads*.

Sect. XII. *The ſeventh objection, That it hinders uſe.*

The laſt failing which is wont to be imputed to *Learned men*, is want of *uſe*, and fear of *practice*, and a converſing with things in their *Studies*, which they meet with no where elſe. It may now perhaps be thought, that an *Experimenter* is as inclinable to theſe weakneſſes, as he that only contemplates; becaus they both keep out of the way, in the ſhaddow; the one in his *Library*, *arguing*, *objecting*, *defending*, *concluding* with himſelf: the other in his *Work-hous*, with ſuch Tools and Materials, whereof many perhaps are not publickly in uſe. Let us then conſider which of them is moſt to be blam'd for converſing with matters unlike

like thoſe that we meet with in *Civil affairs?* and which moſt abounds with *fears* and *doubts*, and miſtaken idæas of *things?*

It cannot be denied, but the men of *Reading* do very much buſy themſelves about ſuch *conceptions*, which are no where to be found out of their own Chambers. The *ſenſe*, the *cuſtom*, the *practice*, the *judgement* of the world, is quite a different thing from what they imagine it to be in private. And therefore it is no wonder, if when they come abroad into buſineſs, the ſight of Men, the Tumult and nois of Cities, and the very brightneſs of Day it ſelf affright them: Like that *Rhetorician*, who having bin us'd to declaim in the ſhade of a *School*, when he came to plead a true cauſe in the open *Air*, deſir'd the Judges to remove their Seat under ſome roof, becauſe the *light* offended him.

But now on the other ſide, the men of *Works* and *Experiments* perhaps do not alwaies handle the very ſame *Subjects* that are acted on the ſtage of the *World*; yet they are ſuch as have a very great reſemblance to them. It is *matter*, a viſible and ſenſible *matter*, which is the object of their *labors*: And the ſame is alſo us'd by men of practical lives. This likeneſs of their *Imployments* will ſoon make the one excel in the other. For it is far eaſier for him who has been converſant in one ſort of *works* to apply himſelf to any other; than for him who has only thought much, to turn a man of *Practice*: as he that can paint the face of a Man or a Lion, will much ſooner come to draw any other Creature; than he who has all the *Rules* of *Limning* in his head, but never yet us'd his hand to lay on a *Colour*.

And as for the *terrors* and *miſapprehenſions* which

commonly confound weaker minds, and make mens hearts to fail and boggle at Trifles; there is ſo little hope of having them remov'd by *Speculation* alone, that it is evident they were firſt produc'd by the moſt *contemplative* men amongſt the *Ancients*; and chiefly prevail'd of late years, when that way of *Learning* floriſh'd. The *Poets* began of old to impoſe the deceit. They to make all things look more venerable than they were, devis'd a thouſand falſe *Chimæras*; on every *Field*, *River*, *Grove*, and *Cave*, they beſtow'd a *Fantaſm* of their own making: With theſe they amaz'd the world; theſe they cloath'd with what ſhapes they pleas'd; by theſe they pretended, that all Wars, and Counſails, and Actions of men were adminiſtred. And in the modern *Ages* theſe *Fantaſtical Forms* were reviv'd, and poſſeſs'd *Chriſtendom*, in the very height of the *Scholemens* time: An infinit number of *Fairies* haunted every houſe; all Churches were fill'd with *Apparitions*; men began to be frighted from their *Cradles*, which fright continu'd to their *Graves*, and their Names alſo were made the cauſes of ſcaring others. All which abuſes if thoſe acute *Philoſophers* did not promote, yet they were never able to overcome; nay, even not ſo much as King *Oberon* and his inviſible *Army*.

But from the time in which the *Real Philoſophy* has appear'd, there is ſcarce any whiſper remaining of ſuch *horrors*: Every man is unſhaken at thoſe Tales, at which his *Anceſtors* trembled: The cours of things goes quietly along, in its own true channel of *Natural Cauſes* and *Effects*. For this we are beholden to *Experiments*; which though they have not yet completed the diſcovery of the true world, yet they have already vanquiſh'd thoſe wild inhabitants of the falſe worlds,

worlds, that us'd to aſtoniſh the minds of men. A Bleſſing for which we ought to be thankful, if we remember, that it is one of the greateſt Curſes that God pronounces on the wicked, *That they ſhall fear where no fear is.*

From what I have ſaid, may be gather'd, That *Experimental Philoſophy* will prevent mens ſpending the ſtrength of their thoughts about *Diſputes*, by turning them to *Works*: That it may well be attended by the united *Labors* of many, without wholly devouring the time of thoſe that *labor*: That it will cure our minds of *Romantic ſwelling*, by ſhewing all things familiarly to them, juſt as large as they are: That it will free them from *perverſity*, by not permitting them to be too peremptory in their *Concluſions*: That it accuſtoms our hands to things which have a neer reſemblance to the buſineſs of life; and, That it draws away the ſhadows which either inlarge or darken *human affairs*. And indeed of the uſual titles by which men of buſineſs are wont to be diſtinguiſh'd, the *Crafty*, the *Formal*, and the *Prudent*; The *Crafty* may anſwer to the *Empyric* in *Philoſophy*; that is, he is ſuch a one who has a great collection of particular *Experiences*, but knows not how to uſe them but to baſe and low ends. The *Formal* man may be compar'd to the meer *Speculative Philoſopher*: For he vainly reduces every thing to grave and ſolemn general *Rules*; without diſcretion, or mature deliberation. And laſtly, the *Prudent* man is like him who proceeds on a conſtant and ſolid cours of *Experiments*. The one in Civil life neither wholly rejects the Wiſdom of *Ancient* or *Modern* times: The other in *Philoſophy* has the ſame reverence for *former Ages*, and regard for the *preſent*. The one does not reſt upon

empty

empty *prudence*, but deſigns it for action: the other does the ſame with his diſcoveries: upon a juſt, ſevere, and deliberate examination of things, they both rays their *Obſervations*, which they do not ſuffer to lye idle, but uſe them to direct the *actions*, and ſupply the *wants* of *human life*.

Sect. XIII. *Experiments uſefull for the cure of mens minds*

Beſides what I have ſaid of the help, which *Experiments* will bring to our public *duties*, and civil *actions*: I promis'd to add ſomething, concerning the aſſiſtance, that they are able to give, towards the management of the privat *motions*, and *paſſions* of our *minds*: Of this I need ſay the leſs, becauſe there is amongſt the *Philoſophers*, a particular Science appointed for this purpoſe, to preſcribe rules for calming our *affections*, and conquering our *vices*. However I will not wholly paſs it over in ſilence. But I will try in few words to make appear, that the *Real Philoſophy* will ſupply our thoughts with excellent *Medicines*, againſt their own *Extravagancees*, and will ſerve in ſome ſort, for the ſame ends, which the *Moral* profeſſes to accompliſh.

If we ſhall caſt an eye on all the *Tempeſts*, which ariſe within our Breaſts, and conſider the cauſes, and remedies of all the violent *deſires*, malicious *envies*, intemperate *joyes*, and irregular *griefs*, by which the lives of moſt men become *miſerable*, or *guilty*: we ſhall find, that they are chiefly produc'd by *Idleneſs*, and may be moſt naturally cur'd by *diverſion*. Whatever *Art* ſhall be able to buſy the *minds* of men, with a conſtant cours of *innocent Works*, or to fill them with as vigorous, and pleaſant Images, as thoſe ill *impreſſions*, by which they are deluded; it will certainly have a ſurer effect in the compoſing, and purifying

purifying of their thoughts, than all the rigid præcepts of the Stoical, or the empty diſtinctions of the *Peripatetic Moraliſts.*

Now then it is requir'd in that *ſtudy*, which ſhall attempt, according to the force of *Nature*, to cure the diſeaſes of the mind, that it keep it from *idleneſs* by full, and earneſt *employments*, and that it poſſeſs it with innocent, various, laſting, and even ſenſible *delights.*

How active, and induſtrious the *Art* of *Experiments* ought to be, may be concluded from the whole tenour of my diſcours: wherein I have often prov'd, that it can never be finiſh'd by the perpetual *labours* of any one man, nay ſcarce by the ſucceſſive force of the greateſt *Aſſembly.*

That therefore being taken for granted, that it will afford eternal *employments*: It is alſo as true that its labors will contain the moſt *affecting*, and the moſt *diverting Delights*: and that thence it has power enough to free the *minds* of men from their vanities, and intemperance, by that very way which the greateſt *Epicure* has no reaſon to reject, by oppoſing pleaſure againſt pleaſure.

And I dare challenge all the corrupt *Arts* of our *Senſes*, or the devices of voluptuous wits, to provide fuller, more changeable, or nearer objects, for the contentment of mens *minds.* It were indeed to be wiſh'd, that ſevere virtu itſelf, attended only by its own *Authority*, were powerful enough to eſtabliſh its dominion. But it cannot be ſo. The corruptions, and infirmities of *human Nature* ſtand in need of all manner of allurements, to draw us to good, and quiet manners. I will therefore propoſe for this end this cours of *Study*, which will not affright us with

with rigid præcepts, or ſou'r looks, or peeviſh commands, but conſiſts of ſenſible *pleaſure*, and beſides will be moſt laſting in its ſatisfaction, and innocent in its remembrance.

What *raptures* can the moſt *voluptuous* men fancy to which theſe are not equal? Can they reliſh nothing but the *pleaſures* of their *ſenſes*? They may here injoy them without guilt or remors. Are they affrighted at the difficulties of *Knowledge*? Here they may meet with a *Study*, that as well fits the moſt *negligent* minds, as the moſt *induſtrious*. This conſiſts of ſo many *Works*, and thoſe ſo obvious, and facil, that the moſt laborious will never find cauſe to be idle, and the moſt idle may ſtill have ſomething to do with the greateſt eaſe. In this they need not weary themſelves by ſearching for *matter*. Whatever they feel, or ſee, will afford them *Obſervations*. In this there is no tedious præparation requir'd to fit them for ſuch indeavors. As ſoon as they have the uſe of their *hands*, and *eies*, and common *ſenſe*, they they are ſufficiently furniſh'd to undertake them: Though we cannot comprehend the *Arts* of men without many prævious *Studies*, yet ſuch is the indulgence of *Nature*, that it has from the beginning, out of its own ſtore, ſufficiently provided every man, with all things, that are needful for the underſtanding of itſelf.

Thus neither the *ſenſual mind*, has any occaſion to contemn *Experiments* as unpleaſant, nor the idle as burdenſome, or intollerable, nor the virtuous as unworthy of his *labors*. And the ſame influence they may have, on all other *moral* imperfections of *human Nature*. What room can there be for low, and little *things* in a *mind* ſo uſefully and ſucceſsfully employd?

What

What *ambitious diſquiets* can torment that man, who has ſo much glory before him, for which there are only requir'd the delightful *Works* of his *hands*? What dark, or melancholy paſſions can overſhadow his *heart*, whoſe *ſenſes* are always full of ſo many various *productions*, of which the leaſt progreſs, and ſucceſs, will affect him with an *innocent joy*? What anger, envy, hatred, or revenge can long torment his breaſt, whome not only the greateſt, and nobleſt objects, but every ſand, every pible, every graſs, every earth, every fly can divert? To whom the return of every ſeaſon, every month, every day, do ſuggeſt a circle of moſt pleaſant *operations*? If the *Antients* preſcrib'd it as a ſufficient *Remedy*, againſt ſuch *violent Paſſions*, only to repeat the Alphabet over: whereby there was leaſure given to the *mind*, to recover itſelf from any ſudden fury: then how much more *effectual Medicines*, againſt the ſame *diſtempers*, may be fetch'd from the whole Alphabet of *Nature*, which repreſents itſelf to our *Conſideration*, in ſo many infinit *Volumes*!

Sect. XIV. *Experiments not dangerous to the Chriſtian Religion.*

I will now proceed to the weightieſt, and moſt ſolemn part of my whole *undertaking*; to make a defence of the *Royal Society*, and this new *Experimental Learning*, in reſpect of the *Chriſtian Faith*. I am not ignorant, in what a ſlippery place I now ſtand; and what a tender matter I am enter'd upon. I know that it is almoſt impoſſible without offence, to ſpeak of things of this Nature, in which all *Mankind*, each *Country*, and now almoſt every *Family*, do ſo widely diſagree among themſelves. I cannot expect that what I ſhall ſay will eſcape miſinterpretation, though it be ſpoken with the greateſt ſim-

plicity, and ſubmiſſion, while I behold that moſt men do rather value themſelves, and others, on the little differences of *Religion*, than the main ſubſtance itſelf; and while the will of *God* is ſo variouſly diſtracted, that what appears to be *Piety* to ſome *Chriſtians*, is abhorr'd as the greateſt ſuperſtition, and hereſy by others.

However to ſmooth my way as much as I can, and to prepare all our ſeveral *Spiritual Intereſts*, to read this part with ſome tolerable *moderation*; I do here in the beginning moſt ſincerely declare, that if this deſign ſhould in the leaſt diminiſh the *Reverence*, that is due to the *Doctrine of Jeſus Chriſt*, it were ſo far from deſerving *protection*, that it ought to be abhorr'd by all the *Politic*, and *Prudent*; as well as by the devout Part of Chriſtendom. And this I profeſs, I think they were bound to do, not only from a juſt dread of the *Being*, the *Worſhip*, the *Omnipotence*, the *Love of God*, all which are to be held in the higheſt veneration: but alſo out of a regard to the peace, and proſperity of men. In matters that concern our *opinions* of another *World*, the leaſt alterations are of wonderful hazard: how miſchievous then would that enterpriſe be, whoſe effects would aboliſh the *command of Conſcience*, the belief of a *future life*; or any of thoſe Hevenly *Doctrines*, by which not only the *eternal condition* of men is ſecur'd, but their *natural Reaſon*, and their *Temporal ſafety* advanc'd? Whoever ſhall impiouſly attempt to ſubvert the Authority of the *Divine Power*, on falſe pretences to better *Knowledge*, he will unſettle the ſtrongeſt foundations of our *hopes*: he will make a terrible confuſion in all the offices, and opinions of men: he will deſtroy the moſt prevailing *Argument* to *virtu*: he

he will remove all *human Actions*, from their firmeſt center: he will even deprive himſelf, of the prærogative of his *Immortal Soul*; and will have the ſame ſucceſs, that the *Antient Fables* make thoſe to have had, who contended with their *Gods*, of whom they report, that many were immediatly turn'd into *Beaſts*.

With theſe apprehenſions I come to examin the *Objections*, which I am now to ſatisfy: and having calmly compar'd the *Arguments* of ſome devout men againſt *Knowledge*, and chiefly that of *Experiments*; I muſt pronounce them both, to be altogether inoffenſive. I did before affirm, that the *Royal Society* is abundantly cautious, not to intermeddle in *Spiritual things*: But that being only a general plea, and the queſtion not lying ſo much on what they do at preſent, as upon the probable effects of their Enterpriſe; I will bring it to the teſt through the chief Parts of *Chriſtianity*; and ſhew that it will be found as much avers from *Atheiſm*, in its iſſue and conſequences, as it was in its original purpoſe.

The public Declaration of the *Chriſtian Religion*, is to propoſe to mankind, an infallible way to *Salvation*. Towards the performance of this happy end, beſides the *Principles* of *Natural Religion*, which conſiſts in the acknowledgment and Worſhip of a *Deity*: It has offer'd us the merits of a glorious *Saviour*: By him, and his *Apoſtles Miniſtry*, it has given us ſufficient *Examples*, and *Doctrines* to acquaint us with *divine things*, and carry us to *Heven*. In every one of theſe, the *Experiments* of *Natural things*, do neither darken our eies, nor deceive our minds, nor deprave our hearts.

Sect. XV. *Experiments will not deſtroy the Doctrine of the Godhead.*

Firſt there can be no juſt reaſon aſſign'd, why an *Experimenter* ſhould be prone to deny the eſſence, and properties of *God*, the univerſal Sovereignty of his *Dominion*, and his *Providence* over the *Creation*. He has before him the very ſame argument, to confirm his judgment in all theſe; with which he himſelf is wont to be abundantly ſatisfy'd, when he meets with it in any of his *Philoſophical Inquiries*. In every thing that he tryes, he believes, that this is enough for him to reſt on, if he finds, that not only his own, but the *univerſal Obſervations* of men of all times and places, without any mutual conſpiracy have conſented in the ſame *concluſion*. How can he then refrain from embracing this common *Truth*, which is witneſs'd by the unanimous approbation of all *Countries*, the agreement of *Nations*, and the ſecret acknowledgment of every mans breaſt?

'Tis true his *employment* is about *material things*. But this is ſo far from drawing him to oppoſe inviſible *Beings*, that it rather puts his thoughts into an excellent good capacity to believe them. In every *work* of *Nature* thathe handles, he knows that there is not only a groſs ſubſtance, which preſents itſelf to all mens eies; but an infinit ſubtilty of *parts*, which come not into the ſharpeſt ſenſe. So that what the *Scripture* relates of the Purity of *God*, of the Spirituality of his *Nature*, and that of *Angels*, and the *Souls* of men, cannot ſeem incredible to him, when he perceives the numberleſs particles that move in everymans *Blood*, and the prodigious ſtreams that continually flow unſeen from every *Body*: Having foundthat his own *ſenſes* have been ſo far aſſiſted by the *Inſtruments* of *Art*, he may ſooner admit,

mit, that his mind ought to be rays'd higher, by a Hevenly light, in thoſe things wherein his *ſenſes* do fall ſhort. If (as the *Apoſtle* ſays) the inviſible things of *God* are manifeſted by the viſible; then how much ſtronger Arguments has he for his belief, in the *eternal power*, and *Godhead*, from the vaſt number of Creatures, that are inviſible to others, but are expos'd to his view by the help of his *Experiments*?

Sect. XVI. *Experiments not injurious to the worſhip of God.*

Thus he is præpar'd to admit a *Deity*, and to embrace the conſequences of that conceſſion. He is alſo from his *Experiments* as well furniſh'd with *Arguments* to adore it: he has always before his eys the *beauty*, *contrivance*, and *order* of *Gods Works*: From hence, he will learn to ſerve him with all reverence, who in all that he has made, conſulted *Ornament*, as well as *Uſe*.

From hence he will beſt underſtand the infinit diſtance between *himſelf*, and his *Creator*, when he finds that all things were produc'd by him: whereas he by all his ſtudy, can ſcarce imitate the leaſt effects, nor haſten, or retard the common cours of *Nature*. This will teach him to *Worſhip* that *Wiſdom*, by which all things are ſo eaſily ſuſtain'd, when he has look'd more familiarly into them, and beheld the chances, and alterations, to which they are expos'd. Hence he will be led to admire the wonderful contrivance of the *Creation*; and ſo to apply, and direct his praiſes aright: which no doubt, when they are offer'd up to *Heven*, from the mouth of one, who has well ſtudied what he commends, will be more ſutable to the *Divine Nature*, than the blind applauſes of the ignorant. This was the firſt ſervice, that *Adam* perform'd to his *Creator*, when he obey'd him in muſtring,

ſtring, and naming, and looking into the *Nature* of all the *Creatures*. This had bin the only *Religion*, if men had continued innocent in *Paradiſe*, and had not wanted a *Redemption*. Of this the *Scripture* itſelf makes ſo much uſe, that if any devout man ſhall reject all *Natural Philoſophy*, he may blot *Geneſis*, and *Job*, and the *Pſalms*, and ſome other Books, out of the *Canon* of the *Bible*. *God* never yet left himſelf without witneſs in the *World*: And it is obſervable, that he has commonly choſen the dark and ignorant *Ages*, wherein to work Miracles; but ſeldom or never the times when *Natural Knowledge* prevail'd: For he knew there was not ſo much need to make uſe of extraordinary ſigns, when men were diligent in the works of his hands, and attentive on the impreſſions of his footſteps in his *Creatures*.

It is almoſt a *proverbial* ſpeech, *That the moſt* Learned Ages *are ſtill the moſt* Atheiſtical, *and the* ignorant *moſt* devout. Whoever devis'd this diſtinction at firſt, the true *Piety* is little beholden to him for it: For inſteed of obeying the *Jewiſh Law*, which forbids us to offer up to *God* a Sacrifice that has a Blemiſh, he has beſtow'd the moſt excellent of all the Race of men on the Devil; and has only aſſign'd to *Religion* thoſe *Men* and thoſe *Times*, which have the greateſt Blemiſh of *human Nature*, even a defect in their *Knowledge* and *Underſtanding*.

If there can be found any colour for this *obſervation*, That the *light* of *Reaſon* ſhould produce a *ſpiritual darkneſs*; it can only then hold good, when the *knowledge* of men, and not that of *Nature* abounds. Whether the firſt be true, or no, let the *Politicians* conſider: But of the ſecond, this is a ſufficient conviction, that in moſt Countries God has been worſhip'd

ſhip'd in a form proportionable to that kind of *Natural Philoſophy* in which they excell'd. In *Perſia*, where the skill of the *hevenly Motions* firſt began, they had their Temples on the Top of Hills, and open to the Air. In *Ægypt* they had the beſt opportunities of ſtudying the Nature of *living Creatures*; by reaſon of that variety which their River and their Land produc'd. And their *Religious Myſteries* were contain'd in *Hieroglyphies*, which were moſt of them borrow'd from Beaſts. And why ſhould *Natural Philoſophy* be now condemn'd, for contempt of all *Divinity*, when of old it did rather incline them to *Superſtition*, which is the other extreme? It is true indeed, by that *knowledge* which they had of many Creatures, they were drawn to adore them; but that was only becauſe it was imperfect: If they had underſtood them thorowly, they had never done it: So true is that ſaying of my Lord *Bacon*, *That by a little knowledge of Nature men become Atheiſts; but a great deal returns them back again to a ſound and Religious mind.* In brief, if we rightly apprehend the matter, it will be found, that it is not only ſottiſhneſs, but prophaneſs, for men to cry out againſt the underſtanding of *Nature*: For that being nothing elſe but the inſtrument of *God*, whereby he gives being and action to *things*; the *knowledge* of it deſerves ſo little to be eſteem'd impious, that it ought rather to be reckon'd as *Divine.*

Sect. XVII. *Experiments not prejudicial to the doctrine of the Goſpel.*

But the chief part of our *Religion*, on which the certainty of all the reſt depends, is the *Evangelical Doctrine* of *Salvation* by *Jeſus Chriſt.* In this there is nothing, from which he that converſes much with *Nature*, can be thought to be more ayers than others; nay,

nay, to which he may not be concluded to be more inclinable, on this very account; ſeing it has all bin prov'd to him his own way. Had not the appearance of *Chriſt* bin ſtrengthen'd by undeniable ſigns of *almighty Power*, no age nor place had bin oblig'd to believe his Meſſage. And theſe *Miracles* with which he aſſerted the *Truths* that he taught (if I might be allow'd this boldneſs in a matter ſo ſacred) I would even venture to call *Divine Experiments* of his *Godhead.*

What then can there be in all this *Doctrine*, at which a Real and impartial *Inquirer* into *Natural Things*, ſhould be offended? Does he demand a Teſtimony from *Heven?* he has it: He reads effects produc'd, that did exceed all mortal skill and force: And of this he himſelf is a better judge than others: For to underſtand aright what is *ſupernatural*, it is a good ſtep firſt to *know* what is according to *Nature.*

Does he require that this ſhould be teſtified, not by men of *Craft* or *Speculation*; but rather by men of *Honeſty*, *Trades*, and *Buſineſs?* The *Apoſtles* were ſuch. Will he not conſent to any mans *Opinions*, unleſs he ſees the *operations* of his hands agree with them? *Chriſt* himſelf requires no more of any of his *Followers:* For he commanded his *Diſciples* not to believe him, but the *Works* that he did. Does he think that it is the moſt honorable Labor to ſtudy the benefit of Mankind? to help their infirmities? to ſupply their wants? to eaſe their burdens? He here may behold the whole *Doctrine* of *Future Happineſs*, introduc'd by th ſame means; by feeding the Hungry, by curing the Lame, and by opening the eyes of the Blind: All which may be call'd *Philoſophical Works*, perform'd by an *Almighty hand.*

What

What then can hinder him from loving and admiring this *Saviour*, whoſe *Deſign* is ſo conformable to his own, but his *Ability* ſo much greater? What jealouſie can he have of an impoſture in this *Meſſias*? Who though his *Doctrine* was ſo pure and venerable, though his *Life* was ſo blameleſs, though he had the power of *Heaven* and *Earth* in his hands, though he knew the thoughts of men, and might have touch'd and mov'd them as he pleas'd; did yet not rely on his *Doctrine*, on his *Life*, on the irreſiſtible aſſiſtance of *Angels*, or on his own *Divinity* alone; but ſtoop'd to convince men by their *Senſes*, and by the very ſame cours by which they receive all their *Natural Knowledge*.

§. XVIII. *Experiments will not overthrow the Doctrine of the Primitive Church.*

The laſt *Doctrinal* part of our *Religion*, I ſhall mention, conſiſts of thoſe *Doctrines* which have been long ſince deduc'd by conſequences from the *Scripture*, and are now ſetled in the Body of that *Divinity*, which was deliver'd down to us by the *Primitive Church*, and which the generality of *Chriſtendom* embraces. It may here be ſuggeſted, that the ſenſible *knowledge* of *things* may in time aboliſh moſt of theſe, by inſinuating into mens minds, that they cannot ſtand before the impartiality of *Philoſophical Inquiſitions*. But this ſurmiſe has no manner of foundation. Theſe Superſtructures are of two ſorts: either thoſe of which a man may have a cleer apprehenſion in his thoughts, upon a rational account, and which are intelligible to any ordinary Reader; or elſe ſuch as exceed the common meaſures of our *Reaſon* and *Senſes*. There will be no fear that an *Experimenter* ſhould reject the firſt, ſeeing they may be conceiv'd by the meaneſt capacity, and have that ſtamp upon

them, which he for the moſt part eſteems the character of *Truth*, that they are vulgar. But now towards the conſenting to the laſt, there is nothing better than to believe them in groſs: And for this he is as well prepar'd as any other *Philoſopher*. If we ſuppoſe him ſufficiently convinc'd of the authority of the Deliverer (as I have already ſhewn he may be) he cannot be ſuſpected for diſavowing his word, though never ſo myſtical; or for reſiſting the voice of him, whoſe Arm he has found to be Omnipotent. This ſubmiſſion of his *judgment* he may make, notwithſtanding the ſeverity of his *Inquiries*: And the moſt ſubtil Speculative man in the world can do no more. After all his acute *Arguings* in *Divinity*, he can never render any one point, which is the proper object of *Faith*, to be plain, and equal, and expreſſible to our *Reaſon*. What good can he then do? ſeing he is not able to make it any way fitter for our *Faith*, by all his *Tranſcendental Notions*, than it was before, on the bare account of the *wondrous Works* of the *Author*.

This is the place in which the *Peripatetic Philoſophy* has long triumph'd: But I cannot imagine on what right. The ſpiritual and ſupernatural part of *Chriſtianity* no *Philoſophy* can reach: And in the plain things there is no need of any at all: So that it is excluded on both accounts. In ſome *Doctrines* it is uſeleſs, by reaſon of their ſublimity; in others, becauſe of their commoneſs. How ſmall aſſiſtance it brings, may be ſeen in thoſe very points, in which its Empire ſeems moſt to be plac'd, in *Gods Decrees*, his *Immateriality*, his *Eternity*, and the holy Myſtery of the *Trinity*: In all which we are only brought into a more learned darkneſs by it; and in which unfathomable Depths

Depths a plain *Believing* is at laſt acknowledg'd by all to be our only Refuge. The truth is, notwithſtanding the great ſtir they have made about *Religion*, if we had only follow'd their light, we had ſtill worſhipp'd the *Creator* and *Redeemer* of the *World*, under the ſame title by which their Prædeceſſors did formerly at *Athens*, as the *Unknown God*.

This I have urg'd ſo far, becauſe I am confident that the reducing of *Chriſtianity* to one particular Sect of *Philoſophy*, and confining it to that, is one of the moſt deſtructive Engines that ever was manag'd againſt it. Of this the Church of *Rome* for her ſhare has already found the ill effects: And the danger is apparent: For by this means the benefit of *Religion* will become very narrow, ſeing where *Reaſon* takes place it will only convince them who are of the ſame opinions in *Philoſophy* with thoſe that convert them. And alſo (that which is worſe) if ever by any fate of *Times*, or change of *Governments*, or ſucceſſion of new *Arts*, that Sect ſhall chance to be quite broken, the *Doctrine* of *Chriſt*, relying upon it, were inevitably ruin'd, unleſs *God* were pleas'd to ſupport it a ſupernatural way, or to reſtore it again by new *Miracles*. *Religion* ought not to be the ſubject of *Diſputations*: It ſhould not ſtand in need of any devices of *reaſon*: It ſhould in this be like the Temporal Laws of all Countries, towards the obeying of which there is no need of *ſyllogiſms* or *diſtinctions*; nothing elſe is neceſſary but a bare promulgation, a common apprehenſion, and ſenſe enough to underſtand the Grammatical meaning of ordinary words. Nor ought *Philoſophers* to regret this divorce: ſeing they have almoſt deſtroy'd themſelves, by keeping *Chriſtianity* ſo long under their guard: By fetching *Religion* out of the *Church*,

and carrying it Captive into the *Schools*, they have made it ſuffer baniſhment from its proper place; and they have withal thereby very much corrupted the ſubſtance of their own *Knowledge*: They have done as the *Philiſtims* by ſeiſing on the *Ark*: who by the ſame action, depriv'd the People of *God* of their *Religion*, and alſo brought a Plague amongſt themſelves.

Sect. XIX. *Experiments will not hinder the Practice of Religion.*

Thus far I truſt it will be confeſs'd, that *Experiments* are unblameable. But yet there is much more behind, of which many pious men are wont to expreſs their jealouſy. For though they ſhall be brought to allow, that all theſe *Doctrines*, which I have nam'd, may ſeem to remain ſafe amidſt the ſtudies of *Natural things*: yet they ſtill whiſper, that they may chance by degrees, to make the ſincerity of devotion appear ridiculous, and to bring the ſtrictneſs of holy life out of faſhion: and that ſo they will ſilently, and by piece-meals, demoliſh *Religion*, which they dare not openly encounter. I will therefore next endeavor the removal of theſe ſcruples, though I ſufficiently underſtand, that it is a very *difficult Work*, to confute ſuch popular, and plauſible errors, which have the pretence of the caus of *God* to confirm them.

The chief ſubſtance of Real, and Sober *Piety*, is contain'd in the devout obſervation of all thoſe ways, whereby *God* has bin pleas'd to manifeſt his Will; and in a right ſeparation of our minds from the luſts, and deſires of the *World*. The moſt remarkable means, whereby he has made known his pleaſure, are thoſe, which have been fix'd, and reveal'd in his *Word*; or elſe the extraordinary ſigns of his Authority, and Command. Con-

Concerning our acknowledgment of his *reveal'd Will* in the *Scripture*, I have already ſpoken. And our obedience to the later conſiſts chiefly of two kinds: an humble ſubmiſſion to *Divine Prophecies*, and a careful obſervance of all *remarkable Providences*. In both which *Experimental Philoſophy* may well be juſtify'd. It may perhaps correct ſome exceſſes, which are incident to them: But it declares no enmity againſt the things themſelves.

The ſum of the whole *Doctrine* of *Prophecies* is this, that the *Great Creator* of the World has the Prærogative of foreſeeing, appointing, and prædicting all future Events: that he has often in former Ages made uſe of this power, by the Viſions, and raptures of holy men inſpir'd from above: that his *infinit Wiſdom* has ſtill the like ability to do the ſame: that whenever ſuch prædictions are accompanied, with undeniable Teſtimonies of their being ſent from *Heven*, they ought to be præfer'd before all *human Laws*.

The true Foundation of *Divine Prodigies*, is much of the ſame Nature with the other. It relyes on theſe ſuppoſitions, that all the Creatures are ſubject to *Gods Word*, by which they were made: that he can alter their *Courſes*, exalt, or deſtroy their *Natures*, and move them to different ends from their own, according to his pleaſure: that this he has often done heretofore: that ſtill his Arm it not weaken'd, nor the ſame *omnipotence* diminiſh'd: that ſtill he may change the wonted Law of the *Creation*, and diſpoſe of the *Beings*, and *motions* of all things, without controul: and that when this is done, it is with a peculiar deſign of puniſhing, or rewarding, or forewarning mankind.

To

To the belief and aſſertion of theſe *Doctrines*, we are oblig'd by the very end of *Religion* itſelf. But yet their counterfeit colors have ſeduc'd many virtuous minds into manifold miſchiefs.

The miſtakes about *Prophecies* may ariſe, either from our abuſing of the old, or a vain ſetting up of new. We err in the firſt, when we tranſlate the ancient *Prophecies* from thoſe times, and Countries, which they did properly regard, to others, which they do not concern. And we offend in the ſecond, when we admit of New *Prophetical Spirits* in this Age, without the uncontroulable tokens of *Heavenly Authority.*

We are guilty of falſe interpretations of *Providences*, and *Wonders*; when we either make thoſe to be *Miracles* that are none; or when we put a falſe ſenſe on thoſe that are real, when we make general events to have a privat aſpect, or particular accidents to have ſome univerſal ſignification. Though both theſe may ſeem at firſt to have the ſtricteſt appearance of *Religion*, yet they are the greateſt uſurpations on the ſecrets of the *Almighty*, and unpardonable præſumptions on his high *Prærogatives* of *Puniſhment*, and *reward.*

Sect. XX. *Experiments will not deſtroy the Doctrine of Prophecies, and Prodigies.*

And now if a moderating of theſe extravagances muſt be eſteem'd prophaneſs, I profeſs, I cannot abſolve the *Experimental Philoſopher.* It muſt be granted, that he will be very ſcrupulous, in believing all manner of Commentaries on *Prophetical Viſions*, in giving liberty to new *prædictions*, and in aſſigning the cauſes, and marking out the paths of *God's Judgments*, amongſt his *Creatures.*

He cannot ſuddenly conclude all extraordinary events

events to be the immediat Finger of *God*, becauſe he familiarly beholds the inward workings of things: and thence perceives that many effects, which uſe to affright the *Ignorant*, are brought forth by the common *Inſtruments* of *Nature*. He cannot be ſuddenly inclin'd, to paſs cenſure on mens eternal condition, from any *Temporal Judgments* that may befall them; becauſe his long convers with all matters, times, and places, has taught him, the truth of what the *Scripture* ſays, that *all things happen alike to all*. He cannot blindly conſent to all imaginations of devout men, about future *Contingencies*: ſeing he is ſo rigid, in examining all particular matters of Fact: He cannot be forward to aſſent to *Spiritual Raptures*, and *Revelations*: becaus he is truly acquainted with the Tempers of mens Bodies, the Compoſition of their Blood, and the power of Fancy: and ſo better underſtands the difference, between *Diſeaſes*, and *Inſpirations*.

But in all this, he commits nothing, that is *Irreligious*. 'Tis true, to deny that *God* has heretofore warn'd the World of what was to come, is to contradict the very Godhead itſelf: But to reject the ſenſe, which any privat man ſhall faſten to it, is not to diſdain the Word of *God*, but the opinions of men like our ſelves. To declare againſt the poſſibility, that new *Prophets* may be ſent from *Heven*, is to inſinuat that the ſame infinit Wiſdom, which once ſhew'd itſelf that way, is now at an end. But to ſlight all pretenders, that come without the help of *Miracles*, is not a contempt of the Spirit, but a juſt circumſpection, that the *Reaſon* of men be not over-reach'd. To deny that God directs the cours of human things, is ſtupidity: But to hearken to every *Prodigy*, that men

men frame againſt their Enemies, or for themſelves, is not to reverence the *Power* of *God*, but to make that ſerve the Paſſions, and intereſts, and revenges of men.

It is a dangerous miſtake, into which many Good men fall; that we neglect the *Dominion of God over the World*, if we do not diſcover in every Turn of human Actions many ſupernatural *Providences*, and miraculous *Events*. Whereas it is enough for the honor of his *Government*, that he guids the whole Creation, in its wonted cours of *Cauſes*, and *Effects*: as it makes as much for the reputation of a Prince's wiſdom, that he can rule his ſubjects peaceably, by his known, and ſtanding Laws, as that he is often forc'd to make uſe of extraordinary juſtice to puniſh, or reward.

Let us then imagin our *Philoſopher*, to have all ſlowneſs of belief, and rigor of Trial, which by ſome is miſcall'd a blindneſs of mind, and hardneſs of heart. Let us ſuppoſe that he is moſt unwilling to grant that any thing exceeds the force of *Nature*, but where a full evidence convinces him. Let it be allow'd, that he is alwayes alarm'd, and ready on his guard, at the noiſe of any *Miraculous Event*; leſt his judgment ſhould be ſurpriz'd by the diſguiſes of *Faith*. But does he by this diminiſh the *Authority* of *Antient Miracles?* or does he not rather confirm them the more, by confining their number, and taking care that every falſhood ſhould not mingle with them? Can he by this undermine *Chriſtianity*, which does not now ſtand in need of ſuch extraordinary Teſtimonies from *Heven?* or do not they rather indanger it, who ſtill venture all its Truths on ſo hazardous a chance? Who require a continuance of

Signs,

Signs, and *Wonders*, as if the works of our *Savior* and his *Apoſtles* had not bin ſufficient: who ought to be eſteem'd the moſt carnally minded? the *Enthuſiaſt*, that pollutes his *Religion*, with his own paſſions? or the *Experimenter*, that will not uſe it to flatter, and obey his own deſires, but to ſubdue them? who is to be thought the greateſt enemy of the *Goſpel*? He that loads mens *Faiths*, by ſo many improbable things, as will go neer to make the reality itſelf ſuſpected? or he that only admits a few *Argnments*, to confirm the *Evangelical Doctrines*, but then chuſes thoſe, that are *unqueſtionable*? It cannot be an ungodly purpoſe to ſtrive to aboliſh all *Holy Cheats*: which are of fatal conſequence, both to the Deceivers, and thoſe that are deceiv'd: to the Deceivers, becauſ they muſt needs be *Hypocrites*, having the artifice in their keeping: to the deceiv'd, becauſe if their eies ſhall be ever open'd, and they chance to find, that they have been deluded in any one thing, they will be apt not only to reject that, but even to deſpiſe the very *Truths* themſelves, which they had before bin taught by thoſe deluders.

It were indeed to be confeſs'd, that this ſeverity of *Cenſure* on *Religious things*, were to be condemn'd in *Experimenters*, if while they deny any wonders, that are falſely attributed to the *True God*, they ſhould approve thoſe of Idols or falſe *Deities*. But that is not objected againſt them. They make no compariſon between his power, and the works of any others, but only between the ſeveral ways of his own manifeſting himſelf. Thus if they leſſen one heap yet they ſtill increaſ the other: In the main they diminiſh nothing of his right. If they take from the *Prodigies*, they add to the ordinary *Works* of the

ſame *Author*. And thoſe ordinary *Works* themſelves, they do almoſt raiſ to the height of *Wonders*, by the exact Diſcovery, which they make of their excellencies: while the *Enthuſiaſt* goes neer to bring down the price of the True, and Primitive *Miracles*, by ſuch a vaſt, and ſuch a negligent augmenting of their number.

Sect. XXI. *On this account Experiments are fit for the preſent Temper of our Nation.*

By this I hope it appears, that this Inquiring, this ſcrupulous, this incredulous Temper is not the diſgrace, but the honor of *Experiments*. And therefore I will declare them to be the moſt ſeaſonable ſtudy, for the preſent *Temper* of our *Nation*. This wild amuzing mens minds, with *Prodigies*, and conceits of *Providences*, has been one of the moſt conſiderable cauſes of thoſe ſpiritual diſtractions, of which our Country has long bin the *Theater*. This is a vanity, to which the Engliſh ſeem to have bin always ſubject above others. There is ſcarce any *Modern Hiſtorian*, that relates our Forein Wars, but he has this *Objection* againſt the *diſpoſition* of our Countrymen, that they us'd to order their affairs of the greateſt importance, according to ſome obſcure *Omens*, or *prædictions*, that paſs'd about amongſt them, on little or no foundations. And at this time, eſpecially this laſt year, this gloomy, and ill-boding humor has prevail'd. So that it is now the fitteſt ſeaſon for *Experiments* to ariſe, to teach us a Wiſdome, which ſprings from the depths of *Knowledge*, to ſhake off the ſhadows, and to ſcatter the miſts, which fill the minds of men with a vain conſternation. This is a *work* well-becoming the moſt *Chriſtian Profeſſion*. For the moſt apparent effect, which attended the paſſion of *Chriſt*, was the putting of an eternal ſilence,

on

on all the falſe oracles, and diſſembled inſpirations of *Antient Times*.

There have bin 'tis true, ſome peculiar occaſions, wherein *God* was pleas'd to convince the World from *Heven*, in a viſible manner. But if we conſider the *Arguments* that us'd to move him to it, we may conclude, that ſuch wonderful ſigns are not often now to be expected.

He has either done it, in Times of groſs ignorance, or in the beginning of a new way of *Religion*, or for the peculiar puniſhment of ſome prævailing wickedneſs: Upon the account of the two firſt, we have no reaſon to expect Wonders in this *Age*: becauſ all ſorts of *Knowledge* do ſo much abound; and becauſ we have a *Religion* already eſtabliſh'd, againſt which the Gates of Hell ſhall never prævail.

The Third Time has bin, when *God* has taken to himſelfe, the *Exemplary Puniſhment* of ſome haynous Sin. From this indeed our *Age* is no more exempted, than it is free from thoſe vices, that are wont to provoke the *Divine Vengeance*. This then we confeſs, that even at this preſent, *God* may declare himſelfe, againſt the Iniquities of men, by the ſupernatural Tokens of his diſpleaſure. But yet the Interpretation of ſuch puniſhments ought to be handled, with the greateſt tenderneſs. For as it is ſaid of the laſt, and General Judgment, *that no man knows the time, when it ſhall happen*; ſo we may alſo affirm of theſe particular *Judgments*: that there is no man, who underſtands the Circumſtances, or occaſions of their infliction, but they are one of the deepeſt parts of *God*'s unſearchable Counſails.

Whenever therefore a hevy calamity falls from *Heven* on our *Nation*, a *univerſal Repentance* is requir'd;

quir'd; but all particular applications of privat men, except to their own hearts, is to be forborn. Every man muſt bewail his own *Tranſgreſſions*, which have increas'd the *Public miſery*. But he muſt not be too haſty, in aſſigning the Cauſes of *Plagues*, or *Fires*, or *inundations* to the ſins of other men. Whoever thinks that way to repent, by condemning the miſcarriages of thoſe parties, that differ from his own, and by reproving them, as the *Authors* of ſuch *miſchiefs*, he is groſly miſtaken: For that is not to repent, but to make a Satyr: That is not an Act of humiliation, but the greateſt *Spiritual Pride*.

It is indeed a diſgrace to the Reaſon, and honor of mankind, that every fantaſtical *Humoriſt* ſhould preſume to interpret all the *ſecret Ordinances* of *Heven*; and to expound the Times, and Seaſons, and Fates of Empires, though he be never ſo ignorant of the very common *Works* of *Nature*, that lye under his Feet. There can be nothing more injurious than this, to mens public, or privat peace. This withdraws our obedience, from the true Image of *God* the rightfull Soveraign, and makes us depend on the vain Images of his pow'r, which are fram'd by our own *imaginations*. This weakens the conſtancy of human actions. This affects men with fears, doubts, irreſolutions, and terrors. It is uſually obſerv'd, that ſuch *preſaging*, and *Prophetical Times*, do commonly fore-run great *deſtructions*, and *revolutions* of human affairs. And that it ſhould be ſo is natural enough, though the *preſages*, and *prodigies* themſelves did ſignify no ſuch events. For this *melancholy*, this *frightful*, this *Aſtrological* humor diſarms mens hearts, it breaks their courage; it confounds their Councils, it makes them help to bring ſuch

ſuch *calamities* on themſelves: Firſt they fancy, that ſuch ill accidents muſt come to paſs: And ſo they render themſelves fit ſubjects to be wrought upon, and very often become the *inſtruments*, to bring thoſe effects about, which they fondly imagin'd were inevitably threatn'd them from *Heven*.

Sect. XXII. *Experiments not prejudicial to Mortification.*

The laſt *accuſation* concerns that which is neceſſary to a *holy life*, the *mortifying* of our *Earthly deſires*. And here the men of a retyr'd, and ſevere devotion are the loudeſt: For they tell us, that we cannot conquer, and deſpiſe the *World* while we ſtudy it ſo much; that we cannot have ſufficient leaſure to reflect on another life, while we are ſo taken up about the Curioſities of this: that we cannot be ſtrict enough in correcting the irregularities of our own thoughts, while we give them ſo much liberty to wander, and ſo pleaſant a Rode wherin to travail; and that it is in vain to ſtrive after the *Purity*, and *Holineſs* of our minds, while we ſuffer them to ſpend ſo much time, on the labors of our *Senſes*. This *Objection* appears at firſt ſight ſomwhat terrible: But I come the more boldly to anſwer it, becauſe there are involv'd in the ſame indictment, all the moſt innocent *Arts*, and civil *Actions* of men, which muſt either ſtand, or fall with *Experiments* in this Trial.

Firſt then I will allege, that if this ſort of *ſtudy*, ſhould be acknowledg'd not to be proper, for the promoting of the ſeverer offices of *Chriſtianity*, yet it would ſufficiently recompence for that, by the aſſiſtance, it may bring to ſome other kinds of *Chriſtian Virtues*: If it ſhall not fill our minds, with the moſt mortifying Images, which may riſe from the terrors of

of *Gods Juſtice*, yet it will make amends for that, by inclining us to adore his *Goodneſs*. If it fits us not ſo well for the ſecrecy of a *Cloſet*: It makes us ſerviceable to the *World*. If it ſhall not ſeem to contribute towards *Godly ſorrow*, or *Contrition*: It will give us more opportunities of *Charity*, *Affability*, *Friendſhip*, and *Generoſity*, which are all of them *divine Graces*, as well as *Faith*, and *Repentance*.

It is a great error to think that *Religion* does only conſiſt in one ſort of *Duties*. It is as various as the Diſpoſitions, the Qualities, the Conditions of men: With ſome, the ſevere, the ſtrict, the retir'd are beſt: with others, the bountiful, the affable, the cheerful, the friendly: Of both which kinds I will not ſay whether is to be prefer'd: But this is true, that while the firſt are chiefly limited to the regulating of our own *Hearts*, the influence of the laſt extends much farther; to ſpread the fame of the *Goſpel* in the *World*; to make it appear lovely in the eies of all beholders; and to allure them to ſubmit to the honorableneſs, the gentleneſs; the eaſineſs of its yoke. And this methinks is evident in our *Saviors* life: For whenever he intended to convert any to his *Faith*, he did it by ſome viſible *good Work*, in the ſight of the Multitude. But he never gain'd any *Diſciple* by the conflicts, which he was pleas'd to undergo in his own mind; for he perform'd his *Faſt*, and his *Agony* alone, in the *Wilderneſs*, and the *Garden*.

In the next place I will affirm, That it is improbable that even the hardeſt and moſt rigorous parts of *Mortification* itſelf ſhould be injur'd by theſe *Studies* more than others; ſeing many duties of which it is compos'd, do bear ſome reſemblance to the qualifi-

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cations that are requiſit in *Experimental Philoſophers.* The ſpiritual *Repentance* is a careful ſurvay of our former Errors, and a reſolution of amendment. The ſpiritual *Humility* is an obſervation of our Defects, and a lowly ſenſe of our own weakneſs. And the *Experimenter* for his part muſt have ſome Qualities that anſwer to theſe: He muſt judge aright of himſelf; he muſt miſdoubt the beſt of his own thoughts; he muſt be ſenſible of his own ignorance, if ever he will attempt to purge and renew his Reaſon: So that if that be true, which is commonly obſerv'd, that men are wont to prove ſuch kinds of *Chriſtians* as they were men before; and that Converſion does not deſtroy, but only exalt our *Tempers*; it may well be concluded, that the doubtful, the ſcrupulous, the diligent *Obſerver* of *Nature*, is neerer to make a modeſt, a ſevere, a meek, an humble *Chriſtian*, than the man of *Speculative Science*, who has better thoughts of himſelf and his own *Knowledge*.

But I need not take ſo great a compaſs in this vindication, when it may be fairly maintain'd, that the true and unfain'd *Mortification* is not at all inconſiſtent with mens conſulting of their happineſs in this world, or being emploi'd about earthly affairs. The honeſt purſuit of the conveniences, decences, and ornaments of a mortal condition, by juſt and regular ways, is by no means contradictory to the moſt real and ſevere duties of a *Chriſtian*. It is true indeed, the irregular proſecution of ſuch things is an offence to *Religion*: But ſo it is alſo to *right Reaſon*, and *Nature* itſelf.

It is a wrong conception of the ſtate of *Grace*, if men believe, that when they enter upon it, they muſt preſently caſt away all the thoughts and deſires of

of *humanity*. If this were ſo, to ſanctifie our *Natures* were not to renew, but to deſtroy them. When we are commanded to *put off the old man*, we are not injoin'd to renounce our Faculties of *Reaſon*. When we are bidden *not to think our own thoughts*, it is not intended that we ſhould forbear all *Natural Actions* and *Inclinations*. Such *Scriptures* as theſe are to be underſtood in a moderate ſenſe: By ſuch expreſſions the irregularity of the *Luſt*, and not the *Natural Deſire* is condemn'd: The *Piety* and *Innocence* of our *Lives*, and not the utter change of our *Eſtate*, is recommended. Seing the *Law* of *Reaſon* intends the happineſs and ſecurity of mankind in this life; and the *Chriſtian Religion* purſues the ſame ends, both in this and a future life; they are ſo far from being oppoſite one to another, that *Religion* may properly be ſtyl'd the beſt and the nobleſt part, the perfection and the crown of the Law of *Nature*.

I will therefore firſt demand, Whether it be not lawful for the ſtricteſt *Chriſtian* to provide for the neceſſities of this life? This Requeſt is modeſt enough: For if they deny it, they will reduce mankind into a condition which is literally wors than that of the Beaſts that periſh; ſeing to them it is natural to ſeek out for all the ways of their own preſervation. I will go on to ask them, Whether it be a breach of the *Law of Chriſtianity* to labor for the advantages of Living, which are injoy'd by others? If this be refus'd me, we ſhall not deprive it of that honor which now juſtly belongs to it, that there is little civility at preſent amongſt men without the Pale of the *Chriſtian Church*.

But in few words, let them tell me, Whether it be indiſpenſably neceſſary for us to be always thinking of

of hevenly things? If ſo, how far ſhort were the very *Apoſtles* of this character of *Sanctity*, which theſe men would preſcribe us? What Traffic, what Commerce, what Government, what ſecular Employment could be allow'd? Where ſhould we at laſt make an end of refining? What would become of all the men of Trade themſelves, of whom this *Age* has ſhewn ſo many pretenders to the pureſt *Religion?*

Let it only therefore be granted, that we are *Men*, and not *Angels:* Let it be confeſs'd, that there may be an *exceſs*, as well as *defect*, in mens opinions of holineſs: And then I will make no ſcruple to ſay, that the *Philoſopher* defiles not his mind when he labors in the *works* of *Nature*; that the Diverſion they give him, will ſtand with the greateſt conſtancy, and the delight of purſuing them, with the truth and reality of *Religion.* But to ſay no more, How can it be imagin'd to be a ſinful and carnal thing, to conſider the objects of our *Senſes*; when *God*, the moſt *ſpiritual Being*, did make them all? Since they firſt were conceiv'd in his unſpotted mind, why may they not innocently enter into ours? For if there be any pollution which neceſſarily flows from thinking of them, it might as well be concluded to ſtick on the *Author*, as on the *Souls* of them that only obſerve them.

Sect. XXIII. *Experiments not dangerous to the Church of* England.

And now having inſiſted ſo long on the parts of the *Chriſtian Religion* in general, it will be leſs needful that I ſhould be large in vindicating this *Deſign* from the imputation of being præjudicial to the *Church of England:* For This has the ſame Intereſt with That, and differs in nothing from its Primitive Pattern, but only in the addition of ſome circumſtances, which make it fit for this *Age* and this *Place:* And therefore

they will both be ſtrengthen'd by the ſame benefits, and weaken'd by the ſame miſchiefs.

What I have then to add concerning our *Church*, ſhall be compriz'd in theſe particulars: That it can never be præjudic'd by the light of *Reaſon*, nor by the improvements of *Knowledge*, nor by the advancement of the *Works* of mens hands.

For the proof of the Firſt; it will be ſufficient to conſider its *True Deſign*, what *Opinions* it principally incounters, and by what *Arguments* it ought to defend itſelf.

The true and certain intereſt of our *Church* is to derive its *Doctrine* from the plain and unqueſtion'd parts of the *Word of God*, and to keep itſelf in a due ſubmiſſion to the *Civil Magiſtrate*. The Extremes which it oppoſes, are *implicit Faith*, and *Enthuſiaſm*: And it is a great miſtake, if men think it cannot be maintain'd againſt theſe, but by the mutual *Arguments* of its Enemies; that it cannot withſtand the *Separatiſts*, but by the Authority of the *Church of Rome*; nor diſſent from the *Church of Rome*, but on the *Tenents* of the *Separatiſts*. The grounds on which it proceeds are different from Both: And they are no other but the Rights of the *Civil Power*, the imitation of the Firſt uncorrupt *Churches*, and the *Scripture* expounded by *Reaſon*: From whence may be concluded, that we cannot make War againſt *Reaſon*, without undermining our own ſtrength, ſeing it is the conſtant weapon we ought to employ.

From this I will farther urge, That the *Church of England* will not only be ſafe amidſt the conſequences of a *Rational Age*, but amidſt all the improvements of *Knowledge*, and the ſubverſion of old Opinions about *Nature*, and introduction of new ways

of

of Reaſoning thereon. This will be evident, when we behold the agreement that is between the preſent *Deſign* of the *Royal Society*, and that of our *Church* in its beginning. They both may lay equal claim to the word *Reformation*; the one having compaſs'd it in *Religion*, the other purpoſing it in *Philoſophy*. They both have taken a like cours to bring this about; each of them paſſing by the *corrupt Copies*, and referring themſelves to the *perfect Originals* for their inſtruction; the one to the *Scripture*, the other to the large Volume of the *Creatures*. They are both unjuſtly accus'd by their enemies of the ſame crimes, of having forſaken the *Ancient Traditions*, and ventur'd on *Novelties*. They both ſuppoſe alike, that their *Anceſtors* might err; and yet retain a ſufficient reverence for them. They both follow the great Præcept of the *Apoſtle*, of *Trying all things*. Such is the Harmony between their *Intereſts* and *Tempers*. It cannot therefore be ſuſpected, that the *Church of England*, that aroſe on the ſame Method, though in different works; that Heroically paſs'd thorow the ſame difficulties, that relies on the ſame *Soveraign's Authority*, ſhould look with jealous eyes on this *Attempt*, which makes no change in the principles of mens conſciences, but chiefly aims at the increas of *Inventions* about the *works* of their hands.

This was the laſt Particular in this Subject which I undertook to make good, That our *Church* can never be impair'd by the growth of the uſeful *Arts* of *Life*. But now I come neerer to it, I find that I may ſafely omit it: For the thing itſelf is ſo manifeſt, that there can be no ground of raiſing a Queſtion about it. If our *Church* ſhould be an Enemy to Commerce, Intelligence, Diſcovery, Navigation, or any ſort of *Mecha-*

nics; how could it be fit for the preſent *Genius* of this *Nation?* What greater advantage could its adverſaries have againſt it? How ſhould we be able to reconcile theſe two titles, which ſo juſtly belong to our *King*, of *Defender of the Faith*, and *Patron of Experimental Knowledge.*

But in this I am not only incorag'd to promiſe, that our *Church* will be out of all danger; but to recommend this *Enterpriſe* to it, as that which will become its other *excellencies*, and is moſt worthy of its *protection.* And I ſhall moſt humbly repreſent to its conſideration, that this is not only an honorable *Work*, but even a neceſſary *Duty*, to which it is oblig'd by *Natural Affection.* The preſent *Inquiring Temper* of this *Age* was at firſt produc'd by the liberty of judging, and ſearching, and reaſoning, which was us'd in the firſt *Reformation.* Though I cannot carry the Inſtitution of the *Royal Society* many years back, yet the ſeeds of it were ſown in King *Edward* the Sixth's, and Queen *Elizabeths* Reign: And ever ſince that time *Experimental Learning* has ſtill retaind ſome vital heat, though it wanted the opportunities of ripening itſelf, which now it injoys. The *Church of England* therefore may juſtly be ſtyl'd the *Mother* of this ſort of *Knowledge*; and ſo the care of its *nouriſhment* and *proſperity* peculiarly lyes upon it.

And indeed this is an honor which ſeems reſerv'd for it alone. From all the ſeveral ſorts of *Enthuſiaſts*, I fear, there cannot much help be expected towards ſuch *Works*, till they ſhall have left off to abhor them under the Title of *vain Philoſophy.*

The *Reformed Churches* of other Countries, though they have given us many men, who have been eminent in this way, yet are not in a condition to promote

mote it by themſelves: For either they have not the incoragement of the *Magiſtrate*; or thoſe that have, are cut ſo ſhort in their Revenue, that they have ſcarce enough to ſupport the Decence of their own Public Worſhip.

The *Church of Rome* has indeed of late look'd more favorably upon it. They will now condemn no man for aſſerting the *Antipodes*: The ſeverity with which they handled *Galileo*, ſeems now very much abated: They now permit their *Jeſuits* to beſtow ſome labors about *Natural Obſervations*, for which they have great advantages by their Travails; and their *Clergy* may juſtly claim ſome ſhare in this honor, as long as the Immortal Names of *Merſennus* and *Gaſſendus* ſhall live.

But ſtill it is a queſtion, Whether that *Church* does not rather connive at, than really intend its progreſs. They have indeed ſeiz'd on ſome parts of *New Philoſophy*; but perhaps it is only with the ſame policy that we often ſee great *Monarchs* uſe, in retaining ſome out-Province of their *Empire*; who, though they find that the benefit does not countervail the charge of keeping it, yet will not wholly quit their Intereſt in it, leſt their *Neighbors* ſhould get poſſeſſion, and fortifie it againſt them. Thus it is likely they have cheriſh'd ſome *Experiments*, not out of zeal to the continuance of ſuch *Studies*, but that the *Proteſtants* might not carry away all the glory, and thence withal get new ſtrength to oppoſe them.

This undertaking therefore is wholly caſt on the *Church of England*, which can have no jealouſie of its effects, to which *Ignorance* is not a ſupport, but an Enemy; which aims not at the captivity, but the freedom of mens minds; which is lately return'd to

a proſperous condition, and having ſuffer'd with the *Crown* in its misfortunes, does now partake of the happy Fruits of its *Reſtoration.*

Nor will *Experimental Philoſophy* be unthankful for the aſſiſtance it ſhall receive: For it will enable us to provide before hand, againſt any alterations in *Religious affairs*, which this *Age* may produce. If we compare the changes to which *Religion* has bin always ſubject, with the preſent face of things, we may ſafely conclude, that whatever viciſſitude ſhall happen about it in our time, it will probably neither be to the advantage of *implicit Faith*, nor of *Enthuſiaſm*, but of *Reaſon.* The fierceneſs of *violent Inſpirations* is in good meaſure departed: the remains of it will be ſoon chac'd out of the World, by the remembrance of the terrible footſteps it has every where left behind it. And though the *Church of Rome* ſtill preſerves its pomp, yet the Real Authority of that too is apparently decaying. It firſt got by degrees into *Temporal Power*, by the means of its *Spiritual*; but now it only upholds ſome ſhadow of the *Spiritual*, by the ſtrength of the *Temporal Dominion* it has obtain'd.

This is the preſent ſtate of *Chriſtendom.* It is now impoſſible to ſpread the ſame clouds over the World again: The univerſal Diſpoſition of this *Age* is bent upon a *rational Religion*: And therefore I renew my affectionat requeſt, That the *Church of England* would provide to have the chief ſhare in its firſt adventure; That it would perſiſt, as it has begun, to incorage *Experiments*, which will be to our *Church* as the *Britiſh Oak* is to our *Empire*, an ornament and defence to the ſoil wherein it is planted.

Thus I have finiſh'd what I intended concerning *Religion*;

Religion; wherein I deſire it might not be thought that I have defended every particular *Sercher* into *Nature*. That could not be juſtly expected from me: For there is no man that makes an *Apology* for any General way, who will take upon him to make good all the actions of all privat men who profeſs it. It is enough for my purpoſe, if it ſhall be granted, that however ſome *Experimenters* may be inclinable to irreligion; yet this rather proceeds from their own *Genius*, than from any corruption that could be contracted from theſe *Studies*; and that if the ſame men had profeſs'd *Phyſic*, or *Law*, or even *Divinity* itſelf, they would have bin in like manner diſaffected towards hevenly things.

I cannot deny, but that ſome *Philoſophers*, by their careleſneſs of a Future Eſtate, have brought a diſcredit on *Knowledge* itſelf: But what condition of men is free from ſuch accuſations? or why muſt we ſtrait believe that their Impiety proceeds from their *Philoſophy*? It is eaſy for men to fall into groſs errors, and to miſtake the wrong cauſes for the True, in the judgement which they make of others opinions and inclinations: When they behold them addicted to ſuch or ſuch Vices, and to have withal ſome good Qualities, in which they themſelves do not excel, they preſently are apt to imagin the *bad* to ariſe from the *good*, and ſo condemn both together; whereas perhaps it ſprung from ſome other hidden cauſe, of which they took no notice.

But let it be a true *Obſervation*, That many *Modern Naturaliſts* have bin negligent in the *Worſhip of God*: yet perhaps they have bin driven on this prophaneſs by the late extravagant exceſſes of *Enthuſiaſm*. The infinit pretences to *Inſpiration*, and *immediat Communion*

nion with God, that have abounded in this *Age*, have carry'd ſeveral men of wit ſo far, as to reject the whole matter; who would not have bin ſo exorbitant, if the others had kept within more moderat Bounds. This is Natural enough to be ſuppos'd; for ſo it has commonly happen'd, that the greateſt degrees of all *contrary Opinions* have met in the ſame *Age*, and have ſtill heighthen'd and increas'd each other.

From hence it may be gather'd, That the way to reduce a *real* and *ſober* ſenſe of *Religion*, is not by indeavoring to caſt a veil of Darkneſs again over the minds of men; but chiefly by allaying the violence of *ſpiritual madneſs*: and that the one extreme will decreas proportionably to the leſs'ning of the other.

It is apparent to all, That the influence which *Chriſtianity* once obtain'd on mens minds, is prodigiouſly decay'd. The Generality of *Chriſtendom* is now well-nigh arriv'd at that Fatal condition, which did immediatly precede the deſtruction of the worſhips of the Ancient World; when the Face of *Religion* in their public *Aſſemblies*, was quite different from that apprehenſion which men had concerning it in privat: In public they obſerv'd its Rules with much ſolemnity, but in privat regarded it not at all. It is difficult to declare by what means and degrees we are come to this dangerous point: But this is certain, that the *ſpiritual vices* of this *Age* have well-nigh contributed as much towards it, as the *Carnal*: And for theſe, the moſt effieacious *Remedy* that man of himſelf can uſe, is not ſo much the ſublime part of *Divinity*, as its intelligible, and natural, and practicable *Doctrines*. The *Medicines* for *Religious diſtempers* muſt be changeable according to the *Diſeaſes*: And in this

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we may imitate *Chriſt* himſelf in his Method of healing mens Bodies: Some Cures he perform'd by his Voice, ſome by Prayer, but ſome by the Touch of his hands, and even by his Spittle mingled with Earth. In a groſs and a ſenſual *Age*, the deepeſt Myſteries of our *Religion* may be proper, to purify the ſtupidity of mens ſpirits: But there muſt be an application of quite different and more ſenſible preſcriptions, in a ſubtil, refin'd, or Enthuſiaſtical time.

Such is the preſent humor of the *World*; and ſuch muſt be the cours of its cure. Men muſt now be told, that as *Religion* is a *hevenly thing*, ſo it is not utterly *Avers* from making uſe of the Rules of *human Prudence*, They muſt be inform'd, that the *True Holineſs* is a ſeverity over our ſelves, and not others: They muſt be inſtructed, that it is not the beſt ſervice that can be done to *Chriſtianity*, to place its chief Præcepts ſo much out of the way, as to make them unfit for men of buſineſs. They muſt remember, that the chief of the *Apoſtles became all things to all men, that he might gain ſome.* But above all, there muſt be caution given, that men do not ſtrive to make themſelves and their own opinions ador'd, while they only ſeem zealous for the honor of *God.* This is a fault which is very incident to men of *devotion:* For when they have once form'd in themſelves a *Perfect Model* of the *Will of God*, and have long confirm'd their minds by continual thinking upon it, they are apt to contemn all others that agree not with them in ſome particulars. Upon this, they have ſtrait the reprochful Term of *Atheiſt* to caſt upon them; which though it be a Title that ought only to be employ'd againſt the bold and inſolent defyers of *Heven* in their *words* and *actions*, yet it is too frequently us'd to expreſs

the malice of any eager and cenſorious ſpirit, that has the confidence to object it.

This, and all other the like *Principles* of *uncharitableneſs*, are to be oppos'd by aſſerting the duties of the *Law* of *Nature*, by the uſe of paſt, and preſent *Times*, by the *Analogy* of human things; by *Moral* Virtu, by the offices of *ſociety*, by the contemplation of *Gods viſible Works*, and ſuch eaſy and rational *Arguments*. Next to the ſuccor of *divine Power*, this is the moſt probable way to preſerve the *Chriſtian Faith* amongſt us: If *God* has not in his wrath reſolv'd to tranſplant it into ſome other quarter of the *Earth*, which has not ſo much neglected his Goodneſs. This indeed were a revolution, which cannot be thought on without horror. The ſubverſion of all *Europe* would attend it. The departure of the *Chriſtian Profeſſion* would be accompanied with as frightful effects, as thoſe which follow'd on the Death of its *Founder*: When the *Hevens* were darken'd, the *Temple* ſhook, the Veil was Rent, the Earth trembled, and the *Philoſopher* had reaſon to cry out, *that either Nature was diſſolving, or the God of Nature dying.*

Sect. XXIV. *Experiments advantageous to Manual Arts.*

I will now enter on the next member of my *Diviſion*, to conſider the purpoſe of the *Royal Society*, and the probable effects of *Experiments*, in reſpect of all the *Manual Trades*, which have been heretofore found out, and adorn'd. And I will diſpatch this *Argument* in the reſolution of theſe Four Queſtions.

Whether the *Mechanic Arts* are ſtill improveable by human *Induſtry?*

Whether it be likely, that they may be advanc'd by any others, beſides the *Mechanic Artiſts* themſelves? Whe-

Whether there be any ground of hope from *Experiments*, towards this Work?

And whether if ſuch *Arts* ſhall hereby happen to multiply, they will not ruine thoſe *Trades*, that are already ſetled?

If in theſe particulars I ſhall Anſwer my Readers doubts, I truſt it will be granted me, that it is not a vain or impoſſible Deſign, to indeavor the increas of *Mechanic contrivances*: that the enterprize is proper for a mixt *Aſſembly*: that the cours, which they obſerve towards it will be effectual: and that the increas of ſuch *Operations* will be inoffenſive to others of the ſame kind, that have been formerly diſcover'd.

Before I examin theſe ſeveral *heads* apart, perhaps it will not be an impertinent labor, to take one general ſurvey of the Principal Degrees, and occaſions, by which the ſeveral *Manufactures* have riſen, which beautify the face of the *Earth*, and have brought forth ſo much pleaſure, and plenty amongſt men.

The Firſt of all human Race, when they were diſpers'd into ſeveral Lands, were at firſt ſuſtain'd by the *Fruits* of the *Earth*, which fell to their ſhare. Theſe at firſt they cheriſh'd, and us'd, not by any *Rules* of *Art*, but by that *Natural ſagacity* which teaches all men, to indeavor their own præſervation. For the peaceable injoyment of theſe, they combin'd into Families, and little Leagues, which were the beginnings of *Civil Government*. But finding that all places did not bring forth all things, for Clothing, Food, and Defence; they either violently ſeis'd on what their Neighbors poſſeſs'd, or elſe they fairly agreed on a *mutual exchange* of the productions of their ſoyls. This Trafic was at firſt made in kind:

And the *Fruits* that were thus barter'd, were either ſpent, or planted in other Grounds. By this means mankind was maintain'd: and ſeveral *Earths* were furniſh'd by *Labor*, with what *Nature* beſtow'd not upon them. For this *Commutation* of their *Fruits*, and of the rude effects of their firſt induſtry, they began to deviſe the conveniencies of *Carriage* by Land, and Water: And to make it ſtill eaſier, and larger; they agreed on ſome common things, to be the univerſal ſtandard of *value*, and *price*: whence aroſe the uſe of *Mony*.

This was the firſt Original of *Trade*, which from a narrow commerce between the Hills, the Vallies, the Woods, the Plains, and the Rivers, that bord-er'd one upon another, is ſince extended to the whole compaſs of the *Earth*. For in cours of Time, the ſmall Clans, and Natural Commonwealths, were devour'd by the ſtrength of the greater; or elſe ſome of the wiſer men reduc'd the Rude multitude into one place, and perſuaded them to live quietly under *Laws*. From thence Mankind began to have the face of *Civility*, which aroſe at firſt, by that which is the beſt means of preſerving it now, by the *greatneſs*, and *enlargement* of *Dominion*.

Then firſt, all the differences of *Living*, and the advantages of *Strength*, and *Empire* did ſhew themſelves. Then ſome took on them to *Rule*, ſome to aſſiſt, or counſail thoſe that Rul'd, and ſome were forc'd to be ſubject to their Power. Thus the *Riches*, and *Dominion*, that were at firſt in common, were unequally divided: The Great, the Wiſe, or the Strong obtain'd a Principal ſhare; and either perſua-ded, or conſtrain'd all the reſt to ſerve them with their Bodies. Thence ſprung all the *Arts* of *convenience*,

ence, and *pleaſure*, while the one part of men would not be content to live according to the firſt plaineſs of *Nature*: and the other were compell'd to work with their hands, for the eaſe, and pleaſure of their *Maſters lives*, and the ſupport of their own. From theſe beginnings the Inventions of *peace*, and *war*, the delights of *Cities*, and *Palaces*, the delicacies of *Food*, the Curioſities of *Clothing*, the varieties of *recreations* took their riſe. And theſe have ſtill continued to increaſe, either by ſome caſual diſcoveries, or by Luxury, or elſe as men have been driven by ſome new neceſſities, to paſs on farther to attempt new ways of maintaining themſelves.

Sect. XXV. *The Manual Arts are ſtill improveable.*

This is the moſt *Natural Method* of the foundation, and progreſs of *Manual Arts*. And they may ſtill be advanc'd to a higher perfection, than they have yet obtain'd, either by the diſcovery of new *matter*, to imploy mens hands; or by a new *Tranſplantation* of the ſame *matter*, or by handling the old ſubjects of *Manufactures* after a new way, in the ſame places.

And Firſt, we have reaſon to expect, that there may ſtill ariſe new *matter*, to be manag'd by *human Art*, and *diligence*: And that from the parts of the *Earth*, that are yet unknown: or from the new diſcover'd *America*: or from our own Seas, and Lands, that have bin long ſearch'd into, and Inhabited.

Firſt by new matter from new Lands.

If ever any more *Countrys* which are now hidden from us, ſhall be reveal'd, it is not to be queſtion'd, but there will be alſo opened to our *obſervation*, very many kinds of *living Creatures*, of *Minerals*, of *Plants*, nay of *Handicrafts*, with which we have been hitherto unacquainted. This may well be expected

if

if we remember, that there was never yet any *Land*, diſcover'd, which has not given us divers new ſorts of *Animals*, and *Fruits*, of different Features, and ſhapes, and virtues from our own, or has not ſupply'd us with ſome new artificial *Engine*, and *Contrivance*.

And that our *Diſcoveries* may ſtill be inlarg'd to farther *Countrys*, it is a good proof, that ſo many ſpatious ſhores, and Mountains, and Promontories, appear to our *Southern*, and *Northern Sailors*; of which we have yet no account, but only ſuch as could be taken by a remote proſpect at Sea. From whence, and from the Figure of the *Earth*, it may be concluded, that almoſt as much ſpace of Ground remains ſtill in the *dark*, as was fully known in the Times of the *Aſſyrian*, or *Perſian Monarchy*. So that without aſſuming the vain prophetic Spirit, which I lately condemn'd, we may foretell, that the *Diſcovery* of another *new World* is ſtill behind.

To accompliſh this, there is only wanting the *Invention of Longitude*, which cannot now be far off, ſeing it is generally allow'd to be feaſible, ſeing ſo many rewards are ready to be heap'd on the *Inventors*; and (I will alſo add) ſeing the *Royal Society* has taken it, into its peculiar care. This if it ſhall be once accompliſh'd, will make well-nigh as much alteration in the World, as the invention of the *Needle* did before. And then our *Poſterity* may outgo us, as much as we can travail farther than the *Ancients*; whoſe *Demy-Gods*, and *Heroes* did eſteem it one of their chief exploits, to make a Journy as far as the *Pillars of Hercules*. Whoever ſhall think this to be a deſperat buſineſs, they can only uſe the ſame *Arguments*, wherewith *Columbus* was at firſt made ridiculous: if he had bin diſcorag'd by the Raillery of his

his adverſaries, by the judgment of moſt *Aſtronomers* of his time, and even by the intreaties of his own *Companions*, but three daies before he had a ſight of *Land*, we had loſt the knowledge of half the *World* at once.

Sect. XXVI. *Mechanics improveable by new matter from America.*

And as for the new-diſcover'd *America*: 'Tis true that has not bin altogether uſeleſs to the *Mechanic Arts*. But ſtill we may gheſs, that much more of its bounty is to come, if we conſider, that it has not yet bin ſhewn above *Two hundred years*: which is ſcarce enough time, to travail it over, deſcribe, and meaſure it, much leſs to pierce into all its ſecrets. Beſides this, a good part of this ſpace was ſpent in the *Conqueſt*, and *ſetling* the *Spaniſh Government*, which is a ſeaſon improper for *Philoſophical diſcoveries*. To this may be added, that the chief deſign of the *Spaniards* thither, has bin the tranſportation of *Bullion*: which being ſo profitable, they may well be thought to have overſeen many other of its *Native Riches*. But above all let us reflect on the temper of the *Spaniards* themſelves. They ſuffer no ſtrangers to arrive there: they permit not the *Natives*, to know more than becomes their ſlaves. And how unfit the *Spaniſh* humor is, to improve *Manufactures*, in a Country ſo diſtant as the *Weſt-Indies*; we may learn by their practice in *Spain* itſelf: where they commonly diſdain to exerciſe any *Manual Crafts*, and permit the profit of them, to be carry'd away by ſtrangers.

From all this, we may make this *Concluſion*, that if ever that vaſt Tract of *Ground* ſhall come to be more familiar to *Europe*, either by a *free Trade*, or by *Conqueſt*, or by any other *Revolution* in its Civil affairs: *America* will appear quite a new thing to us; and

and may furniſh us with an abundance of *Rarities* both Natural, and Artificial; of which we have bin almoſt as much depriv'd by its preſent *Maſters*, as if it had ſtill remain'd a Part of the *unknown World.*

§. XXVII. *By new matter from the World.*

But Laſtly to come nearer home, we have no ground to deſpair, but very much more *matter*, which has bin yet unhandled, may ſtill be brought to light, even in the moſt civil, and moſt Peopled Countries: whoſe *Lands* have bin throughly meaſur'd, by the hands of the moſt *exact Surveyors*; whoſe underground *Riches* have bin accurately pry'd into; whoſe Cities, Iſlands, Rivers, and Provinces, have bin deſcrib'd by the labors of *Geographers.* It is not to be doubted, but ſtill there may be an infinit number of *Creatures*, over our heads, round about us, and under our Feet, in the large ſpace of the *Air*, in the Caverns of the *Earth*, in the Bowels of *Mountains*, in the bottoms of *Seas*, and in the ſhades of *Foreſts*: which have hitherto eſcap'd all *mortal Senſes.* In this the *Microſcope* alone is enough to ſilence all oppoſers. Before that was invented, the chief help that was given to the *eies* by *Glaſſes*, was only to ſtrengthen the dim ſight of old *Age*: But now by the means of that excellent *Inſtrument*, we have a far greater number of different kinds of things reveal'd to us, than were contain'd in the viſible Univers before: And even this is not yet brought to *perfection.* The chief labors that are publiſh'd in this way, have bin the *Obſervations* of ſome *Fellows* of the *Royal Society.* Nor have they as yet apply'd it to all ſubjects, nor tried it in all materials, and Figures of *Glaſs.*

To the *eies* therefore there may ſtill be given a vaſt addition of *Objects*: And proportionably to all the

all the other ſenſes. This Mr. *Hook* has undertaken to make out, that *Taſting*, *Touching*, *Smelling*, and *Hearing*, are as improveable as the *Sight*: And from his excellent *performances* in the one, we may well rely on his *promiſe* in all the reſt.

§. XXVIII. *Mechanics Improvable by Tranſplantations.*

The next *Increas* of *Manual Arts*, which is probable to ſucceed, may happen by the farther *Tranſplanting*, and *Communicating* of the ſeveral *Natural Commodities* of all *Nations*, to other *Airs*, and other *Soils*, and other ways of *Cultivation*. That this is not yet finiſh'd is evident, in that there is no *Land* ſo well furniſh'd, as to produce all the various ſorts of things, which its ground and Temperature is capable to receive: and alſo becauſe many of the moſt fertil *Countrys* contain large ſpaces, that are utterly barren.

This *Work* then may be farther advanc'd, by three kinds of indeavors.

The Firſt by *Tranſplanting* out of one Land into another, of the ſame ſcituation in reſpect of the *Hevens*. This may be tri'd by conveying the Eaſtern *Spices*, and other uſeful *Vegetables*, into our Weſtern *Plantations*. Nor can it be imagin'd, why they ſhould thrive in one *Indies*, and not in the other; why the *Soil* ſhould not be as good where the *Sun ſets*, as where it *riſes*: Seing there are parts of both, which lye under the ſame influence of that, and the other *Celeſtial Bodies*, to whoſe kindly heat and Neighborhood, the *Oriental Nations* are ſuppos'd to owe their advantages. This alſo may be attempted in our *Northern Climats*: As for inſtance, the *Flax* of which we ſtand ſo much in need, may proſper in *Ireland*, in many vaſt Tracts of Ground, now only poſſeſſed by wild *Beaſts*, or *Tories* almoſt as wild.

The ſecond *Advancement* of this *Work* may be accompliſh'd by carrying and tranſplanting *living creatures* and *Vegetables* from one Climat to another. This will be very beneficial, though it will be perform'd with a various ſucceſs. Sometimes the *Soil* and the *Air* being chang'd, will give a new force to the new *Gueſts*; as the *Arabian Horſe*, by mingling with our *Breed*, produces a more ſerviceable *Race* than either of them ſingle. And ſomtimes the alteration will be for the wors; as the *Vine* of *France* brought into *England*, and the *Horſes* and *Dogs* of *England* into *France*; both which are found to degenerat exceedingly: Their *Soil*, and their *Sun*, it ſeems, being fitter to produce things of *pleaſure* and *delight*; and our *Air* and our *Earth* being more proper to beget *valor* and *ſtrength*.

The third way of *communication* to be try'd, is by removing the *Plants* and the productions of the ſame Country from one part of it into another; and by practiſing every where all the ſorts of *Husbandry*, which are us'd in ſome places with ſucceſs. That this is not enough perfected even in *England*, is manifeſt to every one that beholds the *Kentiſh* Orchards, and the *Herefordſhire* Hedges; which ſeem to upbraid the lazineſs of other Countries, whoſe High-ways are only fenc'd with Thorns and Briars, or at the beſt with Haſel; while theirs are beautifi'd with Apples, Pears, and Cherries.

Now then, in every one of theſe *Tranſplantations*, the chief Progreſs that has hitherto bin made, has bin rather for the *collection* of *Curioſities* to adorn *Cabinets* and *Gardens*, than for the ſolidity of *Philoſophical Diſcoveries*: Yet there may be a prodigious advantage made in them all, both for the one end and the

the other. And in this it will be found, as in many other things, that if men only intend a little *curiosity* and *delight*, they will reap not much more by their pains: But if they regard real use, not only the *profit*, but a greater *delight* will also follow thereon.

And for our *incouragement*, whatever attempts of this Nature have succeeded, they have redounded to the great advantage of the *Undertakers*. The *Orange* of *China* being of late brought into *Portugal*, has drawn a great *Revenew* every year from *London* alone. The Vine of the *Rhene* taking root in the *Canaries*, has produc'd a far more delicious juyce, and has made the Rocks and the Sun-burnt Ashes of those Islands, one of the richest spots of Ground in the *World*. And I will also instance in that which is now in a good forwardness: *Virginia* has already given *Silk* for the clothing of our *King*; and it may happen hereafter to give Cloaths to a great part of *Europe*, and a vast Treasure to our *Kings*: If the *Silk-worms* shall thrive there (of which there seems to be no doubt) the profit will be inexpressible. We may guess at it, by considering what numbers of *Caravans*, and how many great Cities in *Persia*, are maintain'd by that *Manufacture* alone, and what mighty Customs it yearly brings into the *Sophi's Revenew*.

Sect. XXIX. *Mechanics improveable by the old matter of Arts.*

But if both these helps should chance to fail; if nothing *new* should ever come into our hands; and if there could be no farther alteration made by *Transplanting*; yet we may still take comfort, and rely on the *old matter* itself, on which all our present *Arts* have bin devis'd. This certainly will take away all distrust in this business: For it may be observ'd, that the greatest part of all our *New Inventions* have not

bin rais'd from Subjects before untouch'd (though they also have given us very many) but from the most studied and most familiar things, that have bin always in mens hands and eies. For this I shall only instance in *Printing*, in the *Circulation of the Blood*, in Mr. *Boyl's* Engine for the sucking out of *Air*, in the making of *Guns*, in the *Microscopical Glasses*, and in the *Pendulum Clocks* of *Hugenius*. What might we have believ'd to be perfect, if not the *Art* of mens *Communicating* their thoughts one to another? What was neerer to them than their *Blood*, by which their Life subsists? And what more ready to be found out than its *Motion?* In what Subject had the wit of *Artificers* bin more shewn, than in the variety of *Clocks* and *Watches?* What thing was more in mens view than *Glass*, thorow which in the East-Countries the very Light itself is admitted, whereby we discern all things else? What more natural to us than the *Air* we breath? with which we form every word to express other things? What was more studied than the *Art of Fighting?* What little *Stratagem*, or *Fortification*, or *Weapon*, could one have thought to have bin conceal'd from the *Greeks* and *Romans*, who were so curious in the *Discipline* of *War?* And yet in all these the most obvious things, the greatest changes have bin made by late *Discoveries*; which cannot but convince us, that many more are still to come from things that are as common, if we shall not be wanting to our selves.

Sect. XXX. *Mechanics Improvable by the spreading of civility.*

And this we have good reason to trust will be effected, if this *Mechanic Genius*, which now prevails in these parts of *Christendom*, shall happen to spread wider amongst our selves, and other *Civil Nations*;

or

or if by ſome good Fate it ſhall paſs farther on to other Countries that were yet never fully civiliz'd. We now behold much of the Northern Coaſts of *Europe* and *Aſia*, and almoſt all *Afric*, to continue in the rude ſtate of *Nature*: I wiſh I had not an inſtance neerer home, and that I did not find ſome parts of our own *Monarchy* in as bad a condition. But why may we not ſuppoſe, that all theſe may in cours of Time be brought to lay aſide the untam'd wildneſs of their preſent manners? Why ſhould we uſe them ſo cruelly as to believe, that the goodneſs of their *Creator* has not alſo appointed them their ſeaſon of polite and happy life, as well as us? Is this more unlikely to happen, than the change that has been made in the *World* theſe laſt ſeventeen hundred years? This has bin ſo remarkable, that if *Ariſtotle*, and *Plato*, and *Demoſthenes*, ſhould now ariſe in *Greece* again, they would ſtand amaz'd at the horrible divaſtation of that which was the *Mother of Arts*. And if *Cæſar* and *Tacitus* ſhould return to life, they would ſcarce believe this *Britain*, and *Gaul*, and *Germany*, to be the ſame which they deſcrib'd: they would now behold them cover'd over with *Cities* and *Palaces*, which were then over-run with *Foreſts* and *Thickets*: they would ſee all manner of *Arts* floriſhing in theſe Countries, where the chief *Art*, that was practis'd in their time, was that barbarous one of *painting their Bodies*, to make them look more terrible in *Battel*.

This then being imagin'd, that there may ſome lucky Tyde of *Civility* flow into thoſe *Lands*, which are yet ſalvage, there will a double improvement thence ariſe, both in reſpect of our ſelves and them: For even the preſent *skilful* parts of mankind, will be thereby made more *skilful*; and the other will not only

only increaſe thoſe *Arts* which we ſhall beſtow upon them, but will alſo venture on new ſerches themſelves.

If any ſhall doubt of the firſt of theſe *Advantages*, let them conſider, that the ſpreading of *Knowledge* wider, does beget a higher and a cleerer *Genius* in thoſe that injoy'd it before.

But the chief Benefit will ariſe from the *New Converts*: For they will not only receive from us our *old Arts*, but in their firſt vigour will proceed to *new ones* that were not thought of before. This is reaſonable enough to be granted: For ſeing they come freſh and unwearied, and the thoughts of men being moſt violent in the firſt opening of their *Fancies*; it is probable they will ſoon paſs over thoſe difficulties about which theſe people that have bin long *Civil*, are already tyr'd. To this purpoſe I might give as many *Examples* as there have bin different *periods* of *Civilizing*; that thoſe *Nations* which have bin taught, have prov'd wiſer and more dextrous than their *Teachers*. The *Greeks* took their firſt hints from the *Eaſt*; but out-did them in *Muſic*, in *Statuary*, in *Graving*, in *Limning*, in *Navigation*, in *Horſmanſhip*, in *Husbandry*, as much as the *Ægyptians* or *Aſſyrians* exceeded their unskilful *Anceſtors* in *Architecture*, *Aſtronomy*, or *Geometry*. The *Germans*, the *French*, the *Britains*, the *Spaniards*, the modern *Italians*, had their light from the *Romans*; but ſurpaſs'd them in moſt of their own *Arts*, and well-nigh doubled the ancient ſtock of *Trades* deliver'd to their keeping.

Sect. XXXI. *Mechanics are improveable by others beſides Tradeſmen.*

So then, the whole *Prize* is not yet taken out of our hands: The *Mechanic Invention* is not quite worn away; nor will be, as long as new Subjects may be

be diſcovered, as long as our old materials may be alter'd or improv'd, and as long as there remains any corner of the *World* without *Civility*. Let us next obſerve, whether men of different ways of life are capable of performing any thing towards it, beſides the *Artificers* themſelves. This will quickly appear undeniable, if we will be convinc'd by *Inſtances*: For it is evident, that divers ſorts of *Manufactures* have been given us by men who were not bred up in *Trades* that reſembled thoſe which they diſcover'd. I ſhall mention Three; that of *Printing*, *Powder*, and the *Bow-Dye*. The *Admirable Art* of *Compoſing Letters* was ſo far from being ſtarted by a man of *Learning*, that it was the Device of a *Soldier*: And *Powder* (to make recompence) was invented by a *Monck*, whoſe cours of life was moſt avers from handling the *Materials* of *War*. The ancient *Tyrian Purple* was brought to light by a *Fiſher*; and if ever it ſhall be recover'd, it is likely to be done by ſome ſuch accident. The *Scarlat* of the *Moderns* is a very beautiful Color; and it was the production of a *Chymiſt*, and not of a *Dyer*.

And indeed the *Inſtances* of this kind are ſo numerous, that I dare in general affirm, That thoſe men who are not peculiarly converſant about any one ſort of *Arts*, may often find out their *Rarities* and *Curioſities* ſooner, than thoſe who have their minds confin'd wholly to them. If we weigh the *Reaſons* why this is probable, it will not be found ſo much a *Paradox*, as perhaps it ſeems at the firſt Reading. The *Tradeſmen* themſelves, having had their hands directed from their Youth in the ſame *Methods of Working*, cannot when they pleaſ ſo eaſily alter their cuſtom and turn themſelves into new Rodes of Practice. Beſides this, they

they chiefly labor for preſent livelyhood, and therefore cannot defer their *Expectations* ſo long, as is commonly requiſit for the ripening of any *new Contrivance*. But eſpecially having long handled their *Inſtruments* in the ſame faſhion, and regarded their *Materials*, with the ſame thoughts, they are not apt to be ſurpriz'd much with them, nor to have any extraordinary *Fancies*, or *Raptures* about them.

Theſe are the uſual defects of the *Artificers* themſelves: Whereas the men of freer lives, have all the contrary advantages. They do not approach thoſe *Trades*, as their dull, and unavoidable, and perpetual *employments*, but as their *Diverſions*. They come to try thoſe *operations*, in which they are not very exact, and ſo will be more frequently ſubject to commit errors in their proceeding: which very faults, and wandrings will often guid them into new *light*, and new *Conceptions*. And laſtly there is alſo ſome privilege to be allow'd to the *generoſity* of their *ſpirits*, which have not bin ſubdu'd, and clogg'd by any conſtant *toyl*, as the others. *Invention* is an *Heroic* thing, and plac'd above the reach of a low, and vulgar *Genius*. It requires an *active*, a bold, a nimble, a reſtleſs *mind*: a thouſand difficulties muſt be contemn'd, with which a mean heart would be broken: many *attempts* muſt be made to no purpoſe: much *Treaſure* muſt ſometimes be ſcatter'd without any return: much violence, and vigor of thoughts muſt attend it: ſome irregularities, and exceſſes muſt be granted it, that would hardly be pardon'd by the ſevere *Rules of Prudence*. All which may perſuade us, that a large, and an unbounded mind is likely to be the *Author* of greater *Productions*, than the calm, obſcure, and fetter'd indeavors of the *Mechanics* themſelves: and that

that as in the *Generation of Children*, thoſe are uſually obſerv'd to be moſt ſprightly, that are the ſtollen Fruits of an unlawful *Bed*; ſo in the Generations of the *Brains*, thoſe are often the moſt vigorous, and witty, which men beget on other *Arts*, and not on their own.

§. XXXII. *Mechanics best Improvable by Experiments.*

This came ſeaſonably in, to ſtop the undeſerv'd clamors, which perhaps in this humorous *Age*, ſome *Tradeſmen* may raiſe againſt the *Royal Society*, for entring within the compaſs of their Territories. Wherefore I proceed to my Third *Particular*, which I have aym'd at in the Two former, *that the ſureſt increaſe remaining to be made in Manual Arts, is to be perform'd by the conduct of Experimental Philoſophy.* This will appear undeniable when we ſhall have found, that all other cauſes of ſuch *Inventions* are *defective*: and that for this very reaſon, becauſ the *Trials of Art*, have bin ſo little united with the plain labors of mens hands.

I have already given this account of the former *Arts* that we uſe, that the greateſt Part of them has bin produc'd, either by *Luxury*, or *chance*, or *neceſſity*: all which muſt be confeſs'd to be mean, and ignoble cauſes of the *Rational Mechanics*.

The Firſt of theſe has bin, that vanity, and intemperance of life, which the delights of *Peace*, and greatneſs of *Empire* have alwayes introduc'd. This has bin the original of very many extravagant *Inventions* of *Pleaſure*: to whoſe *Promotion*, it is not requiſit that we ſhould give any help, ſeing they are already too exceſſive. And indeed, if we conſider the vaſt number of the *Arts* of *Luxury*, compar'd to the ſound, and the ſubſtantial ones of uſe: we ſhall find that the wit of men has bin as much defective in

the one, as redundant in the other. It has been the conſtant error of mens labors in all *Ages*, that they have ſtill directed them to improve thoſe of *pleaſure*, more than thoſe of *profit*. How many, and how extravagant have bin the *Ornaments* about *Coaches?* And how few *Inventions*, about new frames for *Coaches*, or about *Carts*, and *Ploughs?* What prodigious expence has bin thrown away, about the faſhions of *Cloaths?* But how little indeavors have there bin, to invent new *materials* for *Cloathing*, or to perfect thoſe we have? The *Furniture*, and *magnificence* of *Houſes*, is riſen to a wonderful beauty within our memory: but few or none have throughly ſtudied the well ordring of *Timber*, the hardning of *Stone*, the improvement of *Mortar*, and the making of better *Bricks*. The like may be ſhewn in all the reſt: wherein the ſolid *Inventions* are wont to be overwhelm'd by *gawdineſs*, and *ſuperfluity*; which vanity has been caus'd by this, that the *Artiſts* have chiefly bin guided, by the fancies of the rich, or the yong, or of vain *humoriſts*, and not by the *Rules*, and *judgments* of men of *Knowledge*.

The Second occaſion that has given help to the increaſ of *Mechanics* has bin *Chance*: For in all Ages by ſome caſual accidents, thoſe things have bin reveal'd, which either men did not think of, or elſe ſought for in vain. But of this the *Benevolence* is irregular, and moſt uncertain: This indeed can ſcarce be ſtyl'd the *work* of a man. The *Hart* deſerves as much prayſ of *Invention*, for lighting on the herb, that cures it; as the man who blindly ſtumbles on any profitable *Work*, without foreſight, or conſideration.

The laſt that I ſhall allege is *neceſſity*. This has given

given riſe to many great *Enterpriſes*: and like the cruel Step-Mother of *Hercules*, has driven men upon *Heroic Actions*, not out of any tender affection, but hard uſage. Nor has it only bin an excellent Miſtreſs to particular men, but even to whole *States* and *Kingdoms*. For which reaſon ſome have preferr'd a *Barren Soil*, for the Seat of an *Imperial City*, before a *Fruitful*: becauſ thereby the inhabitants being compell'd to take pains, and to live induſtriouſly, will be ſecure from the dangerous inchantments of *plenty*, and *eaſe*; which are fatal to the beginnings of all Commonwealths. Yet the defects of this ſevere *Author* of great *Works*, are very many. It often indeed ingages men in brave attempts, but ſeldom carryes them on to finiſh what they begin: It labors at firſt for want of *Bread*; and that being obtain'd it commonly gives over: It rather ſharpens than enlarges mens *Wits*: It ſooner puts them upon ſmall *ſhifts*, than great *deſigns*: It ſeldom riſes to high, or magnanimous things: For the ſame neceſſity which makes men *inventive*, does commonly depreſs, and fetter their *Inventions*.

And now theſe Principal cauſes of *Mechanic diſcoveries* being found for the greateſt part to be either corrupt, or weak: It is but juſt, that *Reaſon* itſelf ſhould interpoſe, and have ſome place allow'd it in thoſe *Arts*, which ought to be the chief *works* of *Reaſon*. It is a ſhame to the dignity of *human Nature* itſelf, that either mens luſts ſhould tempt them, or their neceſſities drive them, or blind fortune ſhould lead them in the dark, into thoſe things in which conſiſts the chief *Prærogative* of their condition. What greater *Privilege* have men to boaſt of than this; that they have the pow'r of uſing, directing, changing,

or advancing all the reſt of the Creatures? This is the *Dominion* which *God* has given us over the *Works* of his hands. And if we will either anſwer the expectations of *Heven*, or deſerve ſo high an honor, we ought rather to manage this *Dominion* by *diligence*, and *Counſail*, than by *Chance*, or *Luxury*, or *Compulſion*.

It is impoſſible for us to adminiſter this *power* aright, unleſs we prefer the light of men of *Knowledge*, to be a conſtant overſeer, and director, of the *induſtry*, and *Works* of thoſe that labor. The Benefits are vaſt, that will appear upon this conjunction. By this means the *Inventions* of *chance* will be ſpread into all their various uſes, and multiply'd into many new advantages: By this the *Productions* of *neceſſity*, will be amplify'd, and compleated: By this thoſe of *Luxury*, and *Wantoneſs* may be reduc'd to ſome ſolid ends: By this may be rays'd almoſt as certain a Method to invent new *Mechanics*, as now any particular *Mechanics* can practiſe, to produce their own *Operations*: By this the weak minds of the *Artiſts* themſelves will be ſtrengthen'd, their low conceptions advanc'd, and the obſcurity of their ſhops inlighten'd: By this their thoughts will be directed to better *Inſtruments*, and *Materials*: By this their *Poverty* will be aſſiſted, and they will be inabled to attempt more coſtly *Trials*: By this that will be amended, which has bin hitherto the misfortune of ſuch *Inventions*, that they have commonly fallen into mens hands, who underſtand not their *Natures*, *uſes*, or *improvements*: By this the conceptions of men of *Knowledge*, which are wont to ſoar too high, will be made to deſcend into the *material World*: And the flegmatick imaginations of men of *Trade*, which uſe to grovell too much on the ground, will be exalted. It

It was ſaid of *Civil Government* by *Plato*, that then the World will be beſt rul'd, when either *Philoſophers* ſhall be choſen *Kings*, or *Kings* ſhall have *Philoſophical* minds. And I will affirm the like of *Philoſophy*. It will then attain to perfection, when either the *Mechanic Laborers* ſhall have *Philoſophical heads*; or the *Philoſophers* ſhall have *Mechanical hands*: For the proof of this I need only propoſe one inſtance, with which I am furniſh'd by *Antiquity*; and it is of *Archimedes*: by this example alone, we may at once chaſtiſe the ſloth of all *Ages* ſince his time, and confute the preſent contemners of *Mechanic Knowledge*. This *Great man* was one of the firſt who apply'd his ſkill, in the *Mathematics*, and *Phiſics*, to the practices and motions of *Manual Trades*. And in theſe his ſucceſs was ſo prodigious, that the true contrivances of his hands did exceed all the *Fabulous Strength*, which either the *Ancient ſtories*, or modern *Romances* have beſtow'd on their *Heroes*. The *weights* he mov'd were ſo vaſt, and the *Engines* he fram'd had ſuch dreadful effects, that his force could neither be reſiſted, by *Seas*, or *Mountains*, or *Fleets*, or *Armies*, which are the greateſt powers of Nature, and Men. He alone ſuſtain'd the burden of his falling Country: He alone kept the *Romans* at a Bay, to whom the whole World was to yield. And perhaps he had come off victorious at laſt, if he had not contended with the Fatal valour of *Marcellus*: amongſt all whoſe exploits, theſe are recorded as the Two greateſt, that he firſt ſhew'd that *Hannibal* might be ſubdu'd; and that he vanquiſh'd *Syracuſe*, though it was defended by *Archimedes*.

Thus

§. XXXIII. *The invention of new Mechanics will not injure the old.*

Thus far I hope the way is cleer as I go: I have some confidence that I have sufficiently prov'd, that the *Invention* of *Trades* may still proceed farther, and that by the help of men of free lives, and by this cours of *Experiments*. But yet the main *difficulty* continues unremov'd. This arises from the suspicions of the *Tradesmen* themselves: They are generally infected with the narrowness that is natural to *Corporations*, which are wont to resist all *new comers*, as profess'd Enemies to their *Privileges*: And by these interessed men it may be objected, That the growth of *new Inventions* and *new Artificers*, will infallibly reduce all the old ones to poverty and decay.

But to take off their *fears* in this particular, they are to be inform'd, That there are two sorts of *Experiments* which the *Royal Society* attempts in *Mechanical* matters. The first will be employ'd about the revising, changing, and correcting of the old *Mechanics* themselves: The second, about inventing of New. In the first of these they can have no ground of jealousie; seing they are not intended to bring others over their heads, but only to beautifie and fasten those which they already injoy. And even this is a work so necessary to be done, that if there were not a continual reparation made in them, they would soon languish, and insensibly consume away into *Barbarism*: For the *Arts* of mens hands are subject to the same infirmity with *Empire*, the best *Art* of their minds, of which it is truly observ'd, that whenever it comes to stand still, and ceases to advance, it will soon go back and decreas.

Hence it appears, that one part of *Experiments*, and that a very considerable part, is free from their *Cavils*.

Cavils. Let us then go on to the other kinds, which purpoſe the ſtriking out of *new Mechanics*: Of theſe I will alſo aſſert the Innocence, in reſpect of their predeceſſors. In few words, the *Old Arts* are ſo far from being indanger'd by the *New*, that they themſelves will receive a proportionable *increaſ*, as the *New* ſhall ariſe. The warmth and vigour which attends new *Diſcoveries*, is ſeldome wont to confine itſelf to its own Sphere, but is commonly extended farther to the ornament of its Neighbors. This is apparent in the degrees by which all *Nations* uſe to attain to a higher *civility*. The ordinary method wherein this happens, is the introduction of ſome one or two *New Arts*: For they appearing with great activity in the beginning, do not only eſtabliſh themſelves; but alſo by ſtirring and inflaming mens minds, by diſgracing the lazineſs of other *Artizans*, and provoking them to an æmulation, they are wont to bring an *Univerſal light* and *Beauty* on thoſe *Inventions* into whoſe company they are brought.

It is ſaid of the *Moral Virtues*, that they have ſuch a mutual dependance, that no man can attain to *perfection* in any one of them, without ſome degree of the other. And this alſo is certain in the *Mechanic Arts*: The connexion between them is ſo cloſe, that they generally uſe to increaſ in the ſame meaſure. There is no Time, nor great City, which perfectly excells in any one of them, but it is thereby made more capable of admitting the reſt, or of advancing them higher if they were admitted before.

It is true indeed, the increaſ of *Tradeſmen* is an injury to others, that are bred up in particular *Trades*, where there is no greater *Employment* than they can maſter: But there can never be an overcharge of

Trades

Trades themſelves. That *Country* is ſtill the richeſt and moſt powerful, which entertains moſt *Manufactures*. The hands of men employ'd are true *Riches*: The ſaving of thoſe hands by inventions of *Art*, and applying them to other *Works*, will increaſe thoſe *Riches*. Where this is done, there will never a ſufficient matter for profit be wanting: For if there be not vent for their productions at home, we ſhall have it abroad. But where the ways of Life are few, the fountains of Profit will be poſſeſs'd by few; and ſo all the reſt muſt live in *Idleneſs* on which inevitably inſues *Beggery*: Whence it is manifeſt, that *Poverty* is caus'd by the fewneſs of *Trades*, and not by the multitude.

Nor is it enough to overthrow this, to tell us, that by this addition of *Laborers* all things will become dearer, becauſe more muſt be maintain'd: For the high rate of things is an Argument of the floriſhing, and the cheapneſs of the ſcarcity of Money, and ill peopling of all Countries. The firſt is a ſign of many Inhabitants, which are true *Greatneſs*: The ſecond is only a fit ſubject for *Poets* to deſcribe, and to compare to their *Golden Age*: For where all things are without *price* or *value*, they will be without *Arts*, or *Empire*, or *Strength*.

I will explain all this by a Familiar and Domeſtic *Inſtance*. It is probable that there are in *England* a hundred times more *Trades* than the *Saxons* or the *Danes* found here in their Invaſions; and withal the particular *Traders* live now more plentifully, and the whole Nation is wonderfully ſtronger than before. This alſo may be ſeen in every particular *City*: The greater it is, the more kinds of *Artificers* it contains; whoſe neighborhood, and number is ſo far from being

ing an hindrance to each others gain, that ſtill the *Tradeſmen* of moſt populous Towns are welthier than thoſe who profeſs the ſame Crafts in Country Mercats.

In *England* it has of late bin a univerſal *Murmur*, that *Trade* decays; but the contrary is evident, from the perpetual advancement of the *Cuſtoms*: Whence then ariſes the complaint? From hence, that *Traders* have multiplied above the proportionable increas of *Trades*: By this means all the *old* ways of gain are over-ſtock'd, which would ſoon be prevented by a conſtant addition of *new*.

The want of a right apprehending this, has always made the *Engliſh* averſ from admitting of new *Inventions*, and ſhorter ways of labor, and from naturallizing New-people: Both which are the fatal miſtakes that have made the *Hollanders* exceed us in *Riches* and *Trafic*: They receive all *Projects*, and all *People*, and have few or no *Poor*: We have kept them out and ſuppreſs'd them, for the ſake of the *Poor*, whom we thereby do certainly make the poorer.

And here there is ſuggeſted to me a juſt occaſion of lamenting the ill *Treatment* which has bin moſt commonly given to *Inventors*; not only here in *England*, but in all *Ages* and *Countries*. Nor do they only meet with rough uſage from thoſe that envy their honour; but even from the *Artificers* themſelves, for whoſe ſakes they labor: while thoſe that add ſome ſmall matter to things begun, are uſually inrich'd thereby; the *Diſcoverers* themſelves have ſeldom found any any other entertainment than contempt and impoveriſhment. The effects of their *Induſtry* are wont to be decry'd while they live: The fruits of their *Studies* are frequently alienated from their Children:

The little *Tradeſmen* conſpire againſt them, and indeavor to ſtop the Springs from whence they themſelves receive nouriſhment: The common titles with which they are wont to be defam'd, are thoſe of *Cheats* and *Projectors*. I cannot deny, but many ſuch do often mingle themſelves in the noble Throng of *Great Inquirers*: As of old there were ſome that imitated *Philoſophers* only in Beard and auſterity; ſo I grant at this time there may falſe *Experimenters* and *Inventors* ariſe, who will ſtrive to make themſelves admir'd by the loud talking of *Mathematical Engines*, and *Glaſſes*, and *Tools*; and by ſounding in every place ſuch goodly words as *Chymiſtry*, and *Agriculture*, and *Mechanics*. But though the folly of ſuch *Pretenders* cannot be avoided, we muſt not therefore reject the ſober and the judicious *Obſervers*. It is beter ſometimes to indure vanities, than out of too much niceneſs to loſe any real *Invention*. We ought to do with *Philoſophical Works*, as *Miniſters* of *State* with *Intelligence*. It is the wiſeſt cours to give incoragement to all; leſt by ſhewing our ſelves too ſcrupulous of being impos'd on by *falſhoods*, we chance to be depriv'd of the *knowledge* of ſome important *Truths*.

The next *Particular* which I reſolv'd to handle, is the advantage of *Experiments* in reſpect of *Phyſic*. On this I intended to dilate in many words, both becauſe of the great weight of the *Subject*, which concerns the very welfare and health of our lives, and alſo becauſe it would afford me abundant matter for diſcours: For certainly it were eaſy to prove, that there may ſtill a vaſt progreſs be made in the Tru *Art* of *Medicine*, if either we conſider the imperfection of the *Method* of the *Ancient Phyſicians*; or if we obſerve the nature of *Diſeaſes*, which alter, and multiply

multiply upon us every *Age*; or if we reflect on the *Cures* themſelves, and how little the *Invention* of new ones has hitherto bin regarded.

But as I was entring on this *Subject*, I perceiv'd that I might ſafely omit it, ſeing it is already better perform'd by Mr. *Boyl*, in his Book of the *Uſefulneſs of Experimental Philoſophy*. I will therefore withdraw my Pen from this matter, which this Noble Gentleman has manag'd in the beſt and moſt powerful way, by uſing not only the force of *Reaſon*, but the conviction of particular *Inſtances*.

§. XXXIV. *Experiments a proper Study for the Gentlemen of our Nation.*

And now with ſo good an *omen* as this Gentlemans *Example*, who has not diſdain'd to adorn the honor of his *Family* with the Studies of *Nature*; I will go on to recommend them to the *Gentry* and *Nobility* of our *Nation*. And I am the more incorag'd to make this Addreſs, becauſe I behold, that what I would adviſe is already in good meaſure accompliſh'd; ſo that I ſhall not only have an occaſion to *exhort* them to proceed, but to commend them alſo, for their preſent zeal towards theſe *indeavors*.

In this indeed I have much reaſon to applaud the *generous Breeding* which has been given to the *Experimental Knowledge* of this *Age* and *Country*, above the baſe and contemptible *Education* of the Opinions of all former *Sects*: For now *Philoſophy* being admitted into our *Exchange*, our *Church*, our *Palaces*, and our *Court*, has begun to keep the beſt Company, to refine its faſhion and appearance, and to become the Employment of the *Rich*, and the *Great*, inſteed of being the Subject of their *ſcorn*: Whereas it was of old for the moſt part only the Study of the *ſullen*, and the *poor*, who thought it the graveſt part of

Science to contemn the uſe of mankind, and to differ in *habit* and *manners* from all others, whom they ſlighted as madmen and fools. From this arrogant ſordidneſs of ſuch *Principles*, there could not be expected any *Magnificent Works*, but only ill-natur'd and contentious *Doctrines*. Whatever the *Poets* ſay of the *Moral Wiſdom*, that it thrives beſt in *Poverty*; it is certain the *Natural* cannot: for in ſuch mean and narrow conditions men perhaps may learn to *deſpiſe* the World, but never to *know* it.

Now then, I will proceed not ſo much to exhort, as to confirm the *Gentlemen* of our *Nation*, in the proſecution of this *Art*, to which their *Purſes* and their *generous Labors* are moſt neceſſary. And for their incoragement in this way, I will briefly lay before them the Priveleges they have for ſuch *Inquiries*, above all the *Gentry* of our neighbour *Nations*, and above all the *Nobility* of former *Ages* in this *Kingdom*.

One Principal help that they injoy, for the promoting of theſe Studies of Peace, is the preſent *conſtitution* of the *Intereſt* of our *Government*. The chief deſign of the *Antient Engliſh* was the glory of ſpreading their Victories on the Continent: But this was a magnanimous miſtake: For by their very *Conqueſts*, if they had maintain'd them, this *Iſland* had bin ruin'd, and had only become a *Province* to a greater *Empire*. But now it is rightly underſtood, that the *Engliſh* Greatneſs will never be ſupported or increaſed in this *Age*, by any other Wars but thoſe at *Sea*: and for theſe the Service of the Multitude is fitter than of Gentlemen. This we have beheld practis'd theſe laſt twenty years, wherein our *Naval Strength* has more than trebled it ſelf: For though ſome few *Gentlemen*

tlemen have ſtill mingled themſelves in thoſe gallant actions; yet the groſs of our *Fleets* have conſiſted of *common men*, and of *Mariners*, who are bred up in the rude toils of ſuch a life.

As this *Obſervation* may rais us to the greater admiration of their *Valor*, that ſuch *Magnanimity* ſhould be found amongſt the meaneſt of the people; ſo it ſhould alſo ſuggeſt to our *Gentlemen*, who by this means are at liberty from the employments of greateſt danger, that they ought to undertake theſe, which will give them as great, though a ſecurer *honor*. Nor will it be a diſgrace to them, that the fighting for their *Country* is caſt on men of lower ranks, if in the mean time they ſhall ſtrive to inlighten and adorn, while the other defend it: For the ſame is ordain'd by *Nature* itſelf in the order and offices of her *works*: The *Hevenly Bodies* appear to move quietly above, to give light, and to cheriſh the World with a gentle influence; while the *Inſtruments* of *War* and *offence* are taken out of the *Bowels* of the *Earth*.

For the improvement of theſe *Arts* of peaceable *Fame*, they have indeed another Privilege, which can ſcarce be equall'd by any Kingdom in *Europe*: and that is the convenience and benefit of being ſcatter'd in the *Country*. And in truth, the uſual cours of life of the *Engliſh Gentlemen* is ſo well plac'd between the troubleſome noiſ of pompous Magnificence, and the baſeneſs of avaricious Sordidneſs; that the true happineſs of living according to the rules and pleaſures of uncorrupt *Nature*, is more in their power than any others. To them, in this way of life, there can nothing offer itſelf, which may not be turn'd to a *Philoſophical Uſe*. Their *Country Seats* being remov'd from the Tumults of *Cities*, give them the beſt opportunity

portunity, and freedom of *Obſervations*. Their *Hoſpitality*, and familiar way of converſing with their Neighborhood, will alwaies ſupply them with Intelligence. The leaſure which their retirements afford them is ſo great, that either they muſt ſpend their thoughts about ſuch attempts, or in more chargeable and leſs innocent *divertiſements*. If they will conſider the *Hevens*, and the motions of the *Stars*, they have there a quieter *Hemiſphere*, and a clearer *Air* for that purpoſe. If they will obſerve the generations, breedings, diſeaſes, and Cures of *living Creatures*: their Stables, their Stalls, their Kennels, their Parks, their Ponds, will give them eternal matter of inquiry. If they would ſatisfy their minds with the advancing of *Fruits*, the beautifying, the ripening, the bettering of *Plants*; their Paſtures, their Orchards, their Groves, their Gardens their Nurſeries, will furniſh them with perpetual *contemplations*. They may not only make their *buſineſs* but their very *ſports* moſt ſerviceable to *Experimental Knowledge*. For that if it be rightly educated, will ſtand in need of ſuch recreations, as much as the *Gentlemen* themſelves: from their hunting, hawking, fiſhing, and fowling, that is able to receive as much ſolid profit, as they delight.

On both theſe accounts, the *Engliſh Gentry* has the advantage of thoſe of *France*, *Spain*, *Italy*, or *Germany*: who are generally either ſhut up in *Towns*, and dream away their lives in the diverſions of *Cities*: or elſe are ingag'd to follow their *Princes* Wills to forein Wars.

Nor do they only excell other *Nations* in ſuch opportunities, but our own *Nobility* of all former Times. Firſt they are now far more numerous, and ſo more may be ſpar'd from the civil buſineſs of their Country.

try. Beſides this, they are now bred up, and live in a quite different faſhion. The cours of their *Anceſtors lives* was grave, and reſerv'd: They convers'd with few, but their own Servants: and ſeldome travell'd farther than their own Lands: This way ſerv'd well enough to keep up their *State*, and their *Port:* But not to help their underſtandings. For the formalities of *life* do often counterfeit *Wiſdom*, but never beget it. Whereas now they are ingag'd in freer rodes of *Education*: now the vaſt diſtance between them, and other orders of men is no more obſerv'd: now their *converſation* is large, and general: now the *World* is become more *active*, and *induſtrious*: now more of them have ſeen the uſe, and manners of men, and more apply themſelves to *Trafic*, and buſineſs than ever.

This alteration has bin caus'd in our memorie, either by ſo many *Families* being advanc'd to the higheſt degrees of *Nobility*, for their excelling in the *Arts* of the *Gown*: or by their frequent intermarriages with *Citizens*: or by the travails of the *King*, and the *Royal Family*: or elſe by the Civil War itſelf; which is alwayes wont to be the cruelleſt *Tyrant*, or the beſt *Reformer*: either utterly to lay waſt, or to civilize, and beautify, and ripen the *Arts* of all Countries. And ſtill we have reaſon to expect, that this change will proceed farther, for the better: if our *Gentlemen* ſhall more condeſcend to engage in commerce, and to regard the *Philoſophy of Nature*.

The Firſt of theſe ſince the *King*'s return, has bin carry'd on with great vigour, by the *Foundation* of the *Royal Company*: to which as to the Twin-Siſter of the *Royal Society*, we have reaſon as we go along, to wiſh all *Proſperity*. In both theſe *Inſtitutions* begun together,

together, our *King* has imitated the two moſt famous *Works* of the wiſeſt of antient *Kings*: who at the ſame time ſent to *Ophir* for *Gold*, and compos'd a *Natural Hiſtory*, from the Cedar to the Shrub.

Nor ought our *Gentry* to be avers from the promoting of *Trade*, out of any little jealouſy, that thereby they ſhall debaſe themſelves, and corrupt their Blood. For they are to know, that *Trafic*, and *Commerce* have given mankind a higher degree than any title of *Nobility*, even that of *Civility*, and *Humanity* itſelf. And at this time eſpecially above all others, they have no reaſon to deſpiſe *Trade* as below them, when it has ſo great an Influence on the very *Government* of the World. In former ages indeed this was not ſo remarkeable. The Seats of *Empire*, and *Trade* were ſeldom, or never the ſame. *Tyre*, and *Sydon*, and *Cades*, and *Marſeiles* had more *Trafic*, but leſs command than *Rome*, or *Athens*, or *Sparta*, or *Macedon*. But now it is quite otherwiſe. It is now moſt certain that in thoſe Coaſts, whither the greateſt *Trade* ſhall conſtantly flow, the greateſt *Riches*, and *Power* will be eſtabliſh'd. The cauſ of this difference between the antient times, and our own, is hard to be diſcover'd: perhaps it is this, that formerly the greateſt part of the *World* liv'd rudely, on their own *Natural Productions*: but now ſo many *Nations* being Civiliz'd, and living ſplendidly, there is a far greater conſumption of all *forein Commodities*; and ſo the gain of *Trade* is become great enough to overbalance all other ſtrength: Whether this be the *reaſon*, or no, it matters not: But the *obſervation* is true. And this we ſee is ſufficiently known to all our Neighbors, who are earneſtly bent upon the advancing of *Commerce*, as the beſt means, not only to inrich particular Merchants, but to enlarge their *Empire*. The

The next thing to be recommended to the *Gentlemen* of *England*, has a neer kindred with the other: and that is the *Philoſophy* of *Nature*, and *Arts*. For the want of ſuch an eaſy courſ of ſtudies, ſo many of them have miſcarried in their firſt years, and have ever after abhorr'd all manner of *ſober Works*. What elſe do ſignify the univerſal complaints of thoſe who direct the *Education* of great mens Children? Why do they find them ſo hard to be fix'd to any manner of *Knowledge?* Their Teachers indeed are wont to impute it to the delicacy of their breeding, and to their *Mothers fondneſs*. But the chief cauſ of the miſchief lyes deeper. They fill their heads with difficult, and *unintelligible Notions*, which neither afford them pleaſure in learning, nor profit in remembring them: they chiefly inſtruct them in ſuch *Arts*, which are made for the beaten tracks of profeſſions, and not for *Gentlemen*. Whereas their minds ſhould be charm'd by the allurements, of *ſweeter* and more *plauſible Studies*: And for this purpoſe *Experiments* are the fitteſt. Their *Objects* they may feel and behold: Their *productions* are moſt popular: Their *Method* is intelligible, and equal to their capacities: ſo that in them they may ſoon become their own *Teachers*.

Nor are they to contemn them for their *plaineſs*, and the homely *matters*, about which they are often employ'd. If they ſhall think ſcorn to foul their fingers about them on this account, let them caſt their eies back on the *Original Nobility* of all Countries. And if that be true, that every thing is preſerv'd and reſtor'd by the ſame means which did beget it at firſt: they may then be taught, that their preſent *Honor* cannot be maintain'd by intemperate *pleaſures*, or the gawdy ſhews of pomp; but by true *Labors*,

and *Induſtrious Virtu*: Let them reflect on thoſe great men who firſt made the name of *Nobility* venerable. And they ſhall find that amidſt the *Government* of *Nations*, the diſpatch of *Armies*, and noiſe of *Victories*, ſome of them diſdain'd not to *work* with a Spade, to dig the *Earth*, and to cultivate with Triumphing hands, the *Vine*, and the *Olive*. Theſe indeed were times, of which it were well if we had more footſteps, than in antient *Authors*. Then the minds of men were innocent, and ſtrong, and bountiful as the *Earth* in which they labor'd. Then the vices of human *Nature* were not their Pride, but their Scorn. Then *Virtu* was itſelf, neither adulterated by the falſe Idols of *Goodneſs*; nor puff'd up by the empty forms of *Greatneſs*: as ſince it has bin in ſome Countries of *Europe*, which are arriv'd at that *corruption* of *manners*, that perhaps ſome ſevere *Moraliſts* will think it had bin more needful for me to perſuade the men of this Age, to continue *Men*, than to turn *Philoſophers*.

But in this Hiſtory I will forbear all farther *complaints*, which are ſcarce acceptable to the humor of this time, even in our *Divine*, and *Moral works*, in which they are neceſſary. I therefore return to that which I undertook, to the agreeableneſs of this deſign to all *conditions*, and *degrees* of our *Nobility*. If they require ſuch *Studies* as are proportionable to the greatneſs of their *Titles*: they have here thoſe things to conſider, from whence even they themſelves fetch the diſtinctions of their *Gentility*. The Minerals, the Plants, the Stones, the Planets, the Animals, they bear in their *Arms*, are the chief *Inſtruments* of *Heraldry*, by which thoſe *Houſes* are exalted above thoſe of the vulgar. And it is a ſhame for them to boaſt

of

of the bearing of thoſe Creatures they do not underſtand. If they value the *Antiquity* of *Families*, and long race of *Pedigrees*: What can be more worthy their conſideration, than all the divers lineages of *Nature?* Theſe have more proof of their antient deſcent that any of them can ſhew. For they have all continued down in a right line, from *Cauſe* to *Effect*; from the *Creation* to this day. If they ſhall confine themſelves to the *Country*, they have this for there cheap diverſion. If they return to the *City*, this will afford them in every Shop occaſions to inform their *judgments*, and not to devour their *Eſtates*. If they go forth to *public ſervice*, to the leading of *Armies*, or *Navies*, they have this for their perpetual Counſailor, and very often for their preſerver. There are ſo many *Natural*, and *Mechanical things*, to be accurately obſery'd by the greateſt Captains, as the advantages of different Arms, and ammunitions, the paſſages of Rivers, the ſtreights of Mountains, the courſ of Tydes, the ſigns of Weather, the Air, the Sun, the Wind, and the like: that though I will not determin the *Knowledge of Nature*, to be abſolutely neceſſary to the great office of a *General*; yet I may venture to affirm that it will often prove a wonderful aſſiſtance and ornament, to the courſ of *Glory* which he purſues.

All *Hiſtories* are full of Examples of the great accidents, which have happen'd by the ignorance of chief Commanders in *Natural Motions*, and *effects*; of theſe I will only inſtance in Three: The Firſt is of *Cæſar* himſelf, who had Conquer'd more *Countries* than moſt Travailers have ſeen, and gain'd more *Battels* than others have read of; yet he had like to have put a period to all his *Victories*, by the want of

an exact ſkill in one of the commoneſt *Works of Nature*. This he himſelf relates in his ſecond paſſage into *Britain*; when his Army was ſo diſmay'd at the ebbing of the *Sea* from their Fleet, believing it to be a Stratagem of their *Enemies*, that ſcarce the courage and conduct of *Cæſar*, could hinder them from being terrify'd to their own overthrow, which had bin a fatal misfortune to the *Britains*, as well as *Romans*; becauſ from his victorious Arms, we firſt receiv'd the dawn of *Civil Arts*. The next inſtance of this kind is the miſchance which befell the *Chriſtian Army* in *Egypt*, in the time of the *Holy Wars*. Their ſtrength was great and irreſiſtible, if they had only underſtood that which every *Egyptian* could have taught them the courſ, and the Time of the overflowing of the *Nile*. For the want of that ſlender knowledge, the braveſt men of all *Chriſtendome*, were led up to the neck in the River, and were forc'd to yield to their *Enemies* conditions without ſtriking a ſtroke. This was occaſion'd by the ſtupidity of the *Cardinal*, who commanded them; if he had bin leſs ſkillful in the *Scholemen*, and more in *Nature*, that dreadful diſaſter had never happen'd. My Third *Example* of this kind is to be found in the *Roman Hiſtory*: The *Roman Army* was juſt ready to join Battel, with one of their Enemies: the ſign was given for their onſet: their force was equal: a terrible combat had like to have inſu'd: when on the ſudden the *Sun* was *Eclypſ'd*: of this the *Romans* were warn'd the day before. But this ſurpriz'd the other with ſo great affright, that they were immediately *vanquiſh'd*. So that not the braveſt *Men*, nor the greateſt *Army*, nor the beſt proviſions of *War* got the *Victory*: but that Party which had the beſt *Natural Philoſopher* on its ſide.

To

To this addreſs which I have made to our *Nobility*, and *Gentry*, I will add as an appendix another benefit of *Experiments*, which perhaps it will ſcarce become me to name amidſt ſo many matters of greater weight: and that is, that their diſcoveries will be very ſerviceable to the *Wits*, and *Writers* of this, and all future *Ages*. But this I am provok'd to mention by the conſideration of the preſent *Genius* of the *Engliſh Nation*; wherein the ſtudy of *Wit*, and humor of *Writing* prevails ſo much, that there are very few conditions, or degrees, or Ages of Men who are free from its infection. I will therefore declare to all thoſe whom this Spirit has poſſeſs'd, that their is in the *Works of Nature* an inexhauſtible Treaſure of *Fancy*, and *Invention*, which will be reveal'd proportionably to the increaſ of their *Knowledge*.

§ XXXV. *Experiments will be beneficial to our wits and Writers.*

To this purpoſe I muſt premiſe, that it is requir'd in the beſt, and moſt delightful *Wit*; that it be founded on ſuch images which are generally known, and are able to bring a ſtrong, and a ſenſible impreſſion on the *mind*. The ſeveral ſubjects from which it has bin rays'd in all Times, are the *Fables*, and *Religions* of the *Antients*, the *Civil Hiſtories* of all *Countries*, the *Cuſtoms* of *Nations*, the *Bible*, the *Sciences*, and *Manners* of *Men*, the ſeveral *Arts* of their hands, and the works of *Nature*. In all theſe, where there may be a reſemblance of one thing to another, as there may be in all, there is a ſufficient Foundation for *Wit*. This in all its kinds has its increaſes, heigths, and decays, as well as all other human things: Let us then examin what Parts of it are already exhauſted, and what remain new, and untouch'd, and are ſtill likely to be farther advanc'd.

The

The *Wit* of the *Fables* and *Religions* of the *Ancient World* is well-nigh conſum'd: They have already ſerv'd the *Poets* long enough; and it is now high time to diſmiſs them; eſpecially ſeing they have this peculiar *imperfection*, that they were only *Fictions* at firſt: whereas *Truth* is never ſo well expreſs'd or amplify'd, as by thoſe Ornaments which are *True* and *Real* in themſelves.

The *Wit* which is rais'd from *Civil Hiſtories*, and the Cuſtoms of *Countries*, is ſolid and laſting: The *Similitudes* it affords are ſubſtantial, and equal to the minds of men, being drawn from themſelves and their own actions. Of this the wittieſt Nations have always made the greateſt uſe; their writings being adorn'd with a *Wit* that was free of their own *Cities*, conſiſting of *Examples*, and *Apothegms*, and *Proverbs*, derived from their *Anceſtors*. This I allege, becauſe this kind is ſcarce yet begun in the *Engliſh Language*; though our own *Civil Hiſtory* abounds as much as any other, with great *Examples* and memorable Events, which may ſerve for the ornament of Compariſon.

The Manners and Tempers, and Extravagances of men are a ſtanding and eternal foundation of *Wit*: This if it be gather'd from particular *Obſervations*, is call'd *Humor*: And the more particular they are, they are ſtill the pleaſanter. In this kind I may well affirm that our *Nation* excells all others, as our *Dramatic Poetry* may witneſs.

The *Wit* that may be borrow'd from the *Bible* is magnificent, and as all the other Treaſures of *Knowledge* it contains, inexhauſtible. This may be us'd and allow'd without any danger of prophaneſs. The *Ancient Hethens* did the ſame: They made their *Divine*

Ceremonies

Ceremonies the chief Subjects of their *Fancies*: By that means their *Religions* had a more awful impreſſion, became more popular, and laſted longer in force than elſe they would have done. And why may not *Chriſtianity* admit the ſame thing, if it be practis'd with *ſobriety* and *reverence*? What irreligion can there be in applying ſome *Scripture-expreſſions* to *Natural things*? Why are not the one rather exalted and purifi'd, than the other defil'd by ſuch applications? The very *Enthuſiaſts* themſelves, who are wont to ſtart at ſuch *Wit* as *Atheiſtical*, are more guilty of its exceſſes than any other ſort of men: For whatever they allege out of the *Hiſtorical*, *Prophetical*, or *Evangelical Writings*, and apply it to themſelves, their Enemies, or their Country, though they call it the mind of *God*, yet it is nothing elſe but *Scripture-compariſon* and *Similitude*.

The *Sciences* of mens brains are none of the beſt Materials for this kind of *Wit*. Very few have happily ſucceeded in *Logical*, *Metaphyſical*, *Grammatical*, nay even ſcarce in *Mathematical Compariſons*; and the reaſon is, becauſe they are moſt of them converſant about things remov'd from the Senſes, and ſo cannot ſurpriſe the *fancy* with very obvious, or quick, or ſenſible delights.

The *Wit* that is founded on the *Arts* of mens hands is maſculine and durable: It conſiſts of *Images* that are generally obſerv'd, and ſuch viſible things which are familiar to mens minds. This therefore I will reckon as the firſt ſort, which is ſtill improvable by the advancement of *Experiments*.

And to this I will add the *Works of Nature*, which are one of the beſt and moſt fruitful Soils for the growth of *Wit*. It is apparent, that the defect of the

the *Antients* in *Natural Knowledge* did alſo ſtreighten their *Fancies*: Thoſe few things which they knew, they us'd ſo much, and appli'd ſo often, that they even almoſt wore them away by their uſing. The ſweetneſs of Flowers, and Fruits, and Herbs, they had quite devour'd: They had tir'd out the *Sun*, and *Moon*, and *Stars* with their Similitudes, more than they fancy them to be wearied by their daily journeys round the *Hevens*.

It is now therefore ſeaſonable for *Natural Knowledge* to come forth, and to give us the *underſtanding* of new *Virtues* and *Qualities* of things; which may relieve their fellow-creatures, that have long born the burden alone, and have long bin vex'd by the imaginations of *Poets*. This charitable aſſiſtance *Experiments* will ſoon beſtow. The Compariſons which theſe may afford will be intelligible to all, becauſ they proceed from things that enter into all mens Senſes. Theſe will make the moſt vigorous impreſſions on mens *Fancies*, becauſ they do even touch their *Eyes*, and are neereſt to their *Nature*. Of theſe the variety will be infinit; for the particulars are ſo, from whence they may be deduc'd: Theſe may be always new and unſullied, ſeing there is ſuch a vaſt number of *Natural* and *Mechanical things*, not yet fully known or improv'd, and by conſequence not yet ſufficiently apply'd.

The uſe of *Experiments* to this purpoſe is evident, by the wonderful advantage that my Lord *Bacon* receiv'd from them. This excellent Writer was abundantly recompenc'd for his Noble Labors in that *Philoſophy*, by a vaſt Treaſure of admirable *Imaginations* which it afforded him, wherewith to expreſs and adorn his thoughts about other matters. But I will

will not confine this *Obſervation* to one ſingle *Author*, though he was one of the firſt and moſt artificial Managers of this way of *Wit*. I will venture to declare in general of the *Engliſh Tongue*, That as it contains a greater ſtock of *Natural* and *Mechanical Diſcoveries*, ſo it is alſo more inrich'd with beautiful *Conceptions*, and inimitable *Similitudes*, gather'd from the *Arts* of mens hands, and the *Works of Nature*, than ever any other *Language* could produce.

And now I hope what I have here ſaid will prevail ſomthing with the *Wits* and *Railleurs* of this *Age*, to reconcile their Opinions and Diſcourſes to theſe *Studies*: For now they may behold that their Intereſt is united with that of the *Royal Society*; and that if they ſhall decry the promoting of *Experiments*, they will deprive themſelves of the moſt fertil Subject of *Fancy*: And indeed it has bin with reſpect to theſe terrible men, that I have made this long digreſſion. I acknowledge that we ought to have a great dread of their power: I confeſs I believe that *New Philoſophy* need not (as *Cæſar*) fear the pale, or the melancholy, as much as the humorous, and the merry: For they perhaps by making it ridiculous, becauſ it is *new*, and becauſ they themſelves are unwilling to take pains about it, may do it more injury than all the Arguments of our ſevere and frowning and dogmatical *Adverſaries*.

But to gain their good will, I muſt acquaint them, That the Family of the *Railleurs* is deriv'd from the ſame Original with the *Philoſophers*. The Founder of *Philoſophy* is confeſs'd by all to be *Socrates*; and he alſo was the famous Author of all *Irony*. They ought therefore to be tender in this matter, wherein the honor of their *Common Parent* is concern'd: It be-

comes them to remember, that it is the fault, and not the excellence of *Wit*, to defile its own Neſt, and not to ſpare its own Friends and Relations, for the ſake of a jeſt.

The truth is, The Extremes of *Raillery* are more offenſive than thoſe of *Stupidity*: It is a work of ſuch a tender and ſubtil ſpirit, that it cannot be decently perform'd by all pretenders to it: Nor does it always agree well with the Temper of our *Nation*; which as it has a greater corage than to ſuffer *deriſion*, ſo it has a firmer virtu than to be wholly taken up about deriding of others. Such men are therefore to know, That all things are capable of abuſe from the ſame *Topicks* by which they may be commended; they are to conſider, That Laughter is the eaſieſt and the ſlendreſt fruit of *Wit*; they are to underſtand, That it proceeds from the obſervation of the *deformity* of things; but that there is a nobler and more maſculine pleaſure, which is rais'd from beholding their *Order* and *Beauty*: From thence they may conclude, how great the difference is between them, and the real *Philoſophers*: For while *Nature* has only form'd them to be pleas'd with its irregularities and monſters, it has given the other the delight of knowing and ſtudying its moſt *beautiful Works*.

In plain terms, a univerſal abuſe of every thing, though it may tickle the fancy never ſo much, is *inhuman madneſs*; as one of the *Ancients* well expreſſes it, who calls ſuch mirth *humanis Bacchari rebus*. If all things were made the ſubjects of ſuch humour, all worthy deſigns would ſoon be laugh'd out of the World; and for our preſent ſport, our *Poſterity* would become barbarous. All good Enterpriſes ought to find aſſiſtance when they are begun, applauſ when they

they ſucceed, and even pity and praiſ if they fail. The true *Raillery* ſhould be a defence for *Good* and *Virtuous Works*, and ſhould only intend the deriſion of extravagant, and the diſgrace of vile and diſhonourable things. This kind of *Wit* ought to have the nature of *Salt*, to which it is uſually compar'd; which preſerves and keeps ſweet the good and the ſound parts of all Bodies, and only frets, dries up, and deſtroys thoſe humors which putrify and corrupt.

This pleaſant but unprofitable ſort of men being thus diſmiſs'd with this fair *admonition*; It now follows in the laſt place, that I examin the Univerſal Intereſt of the *Engliſh Nation*, and conſider what effect the *Works* of the *Royal Society* are like to have upon it, by what means their *Labors* may ſerve to encreaſ our advantages, and correct our imperfections. In the entrance of this Subject there are ſo many things preſented to my thoughts, which are worthy to be declar'd to my *Countrymen*, that I rather think it ought to be largely manag'd by itſelf, than to be huddled up in the end of this *Treatiſe*; And certainly there is ſcarce any matter that more deſerves to be handled by the beſt of our *Engliſh Wits*, than the *Intereſt* of their *Country*. I do therefore take the freedom to recommend it to their hands; and to beſeech them to raiſ their thoughts from ſlighter buſineſſes, from unmanly flatteries, or vanities of *Love*, or uſeleſs *Burleſque*, to this grave and this Noble *Argument*; and to remember, that if *Themiſtocles* was in the right, when he præfer'd the making of a ſmall *City* great, before the playing on a *Fiddle*, then certainly it is the braveſt employment for a worthy mind, to endeavor to make a great *Kingdom* greater.

§XXXVIII. *Experiments advantageous to the Intereſt of our Nation.*

There are very many things in the *Natural Genius* of the *Engliſh*, which qualify them above any other for a *Governing Nation*. The ſcituation of our *Country* is moſt advantageous for *Command*: Its native productions are moſt ſerviceable for *ſtrength* and *Empire*: The diſpoſition of the people is bold in dangers, ſevere in Diſcipline, valiant in Arms, virtuous in Life, relenting to the afflicted, and merciful in Conqueſt. The unfortunat Diviſions by which our *Force* has bin of late diſtracted, are but of one or two *Ages* growth; the Vices to which we are ſubject are not natural to our *Soil*, but imported hither from forein *Countries*: The *Engliſh* Generoſity, Fidelity, Magnanimity, Modeſty, Integrity, they ow to themſelves; their Luxury, their Debauchery, their Diviſions, their Spiritual Schiſms, they have receiv'd from abroad.

And now what can be a greater work than the management of all theſe matters? Here the *Writer* might have occaſion of doing right to the honor of his *Country*, and yet reproving its faults with a juſt cenſure: He might explain the weakneſſes and advantages of our *Kingdom*: He might remove the one, and confirm the other: He might compare the Actions of our *Anceſtors* with the Manners of this *Time*, and ſhew by what degrees this diſſolution of *goodneſs* crept in: He might with a generous and tender hand, apply himſelf to the cure of our *Religious Diſtempers*: He might with irreſiſtible *Arguments* attempt to amend what is amiſs, reſtore the *good*, and by the power of Domeſtic Examples reduce us back to the ancient ſincerity of *dealing*, and *innocence* of *Life*, and union of *Intereſts*.

The deſire of ſeing this work perform'd, ſits ſo much on my mind, that I cannot but once more repreſent it to

to the conſideration of the many eloquent and judicious *Authors*, with whom our *Nation* is now more abundantly furniſh'd than ever. But if neither the neceſſity nor uſefulneſs of the Subject, nor the benefit of their Native Land, will prevail with them to ſet upon it; it is my purpoſe to excite them by another way, which will indeed be hazardous to my own *reputation*, yet perhaps may take effect. I will try the ſame ſtratagem which I have often ſeen unskilful Singers uſe, to make thoſe who have excellent voices ſhew their *Art*: For as they by ill *ſinging* ſome excellent Tune are wont to provoke the others to *ſing*, when no perſuaſions could move them; ſo do I intend at my firſt leaſure, by ill handling of this *Noble Subject*, to ſtir up men of greater abilities to imploy their skill and their judgment about it.

Having thus taken this task on my ſelf, it will not be needful here to inſiſt long upon it before hand: I will only in few words declare, That it is the Tru concernment of *England* to ſecure itſelf from the *Dominion* of *Strangers*, both *Eccleſiaſtical* and *Temporal*; to advance its Induſtry in peaceful *Arts*; to increaſ its *people*; to improve its own *Manufactures*; to introduce the forein, of which our ſoil is capable; to make uſe of the two *Kingdoms* that are joyn'd with it under the ſame *Monarch*, for thoſe productions which grow not at home; to obtain a union of mind, both in *Civil* and *Spiritual Matters*; and to preſerve the ancient form of *Government*.

Of all theſe I will only touch upon thoſe parts of our *Intereſt* which have reference to the deſign of the *Royal Society*.

The firſt thing that ought to be improv'd in the *Engliſh Nation*, is their *Induſtry*. This, it is tru, has

of

of late years bin marvellouſly advanc'd: as may be ſhewn, by the enlarging of *Trafic*, the ſpreading of many *Fruits*, the plantations of *Trees*, and the great improvement of *Manual Arts*. But it is evident, that it may ſtill admit of farther warmth, and activity: as we may conclude, by the want of employment for yonger Brothers, and many other conditions of men; and by the number of our poor, whom *Idleneſs*, and not *infirmities* do impoveriſh. The way to compaſs this, is not alone by *Acts of Parliament*, and good *Laws*: whoſe force will ſoon be evaded by preſent Craft, and interpretation, or elſe will be *antiquated* by time. This perhaps our *Country* has found above all others: If our *Laborers* had bin as diligent, as our *Law-givers*, we had prov'd the moſt laborious Nation under *Heven*. But the tru Method of increaſing *Induſtry*, is by that courſ which the *Royal Society* has begun in *Philoſophy*, by *Works*, and *endeavors*, and not by the præſcriptions of *words*, or *Paper Commands*.

There is nothing whoſe promoting is ſo eaſy as *diligence*, when it is once ſet on foot. This does not only propagat *works* but *workers*: Though at firſt it may begin on *neceſſity*, yet it will afterwards proceed upon *pleaſure*: So that the farther it goes, the ſwifter it advances becauſ *willing works* are ſooner perform'd than thoſe to which we are compell'd. This I will demonſtrate by an *inſtance* which I have already alledg'd, and it is of the *Hollanders*: For we may fetch *examples* of *virtu* from our own Countrymen, but of *Induſtry* from them. At firſt they were as lazy as the worſt of ours: their hands were unus'd to labor: their manner of life was much like that of the *Ancient Britains*: their Coaſts lay deſolat to the Sea, without

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out Bancks, or Towns, or Ships, or harbors: and when the *Roman Emperor* gather'd Cockles there, perhaps there was litle elſe worth gathering. But when by the number of their people they were fore'd to look abroad, to Trade, to Fiſh, to *labor* in *Mechanics*; they ſoon found the ſweetneſs as well as the toyl of their *diligence*: their ſucceſſes and riches ſtill added new heat to their minds; and thus they have continued *improving*, till they have not only diſgrac'd but terrify'd their *Neighbors*, by their *Induſtry*. Nor will it ſuffice to tell us, that they ow this activity to the form of their *Government*. That ſuppoſition may preſently be confuted by the Example of *France*, the moſt abſolute *Monarchy* of *Chriſtendome*. There it is apparent by the prodigious toyls of their people, both upon the Earth, and in their Shops, that *diligence* may thrive in a *Kingdom*, as well as a *Common-wealth*.

And if ever the *Engliſh* will attain to the *Maſtery* of *Commerce*, not only in *diſcourſ*, but *reality*: they muſt begin it by their *labors*, as well as by their *ſwords*: they muſt do it by awakening their minds, by rouzing themſelves from this Lethargy, by *action*, by *trials*, by *working*: Unleſs this be done, they will in vain be *Victorious*: At the end of their *Wars* they will cool again, and loſe all the fruits of their *Valour*. The *Arts* of peace, and their *Improvements*, muſt proceed in equal ſteps with the ſucceſs of their *Arms*: The *works* of our Citizens, our Plough-men, our Gardners, our Wood-men, our Fiſhers, our diggers in Mines, muſt be equally advanc'd with the *Triumphs* of our *Fleets*: or elſe their blood will be ſhed in vain: they will ſoon return to the ſame poverty, and want of *Trade*, which they ſtrove to avoid. For as *Tully* profeſſes, *neminem video eloquentem factum eſſe victoriâ*:

ria: So I will affirm, *that we ſhall never be made Induſtrious by Victory alone.*

The Second thing to be corrected in the *Engliſh humor*, is an inclination to every *Novelty*, and vanity of forein *Countries*, and a contempt of the good things of our own. This fondneſs is the uſual fault of young *Travailers*, but it has alſo ill effects on men of full *Age*. For this they are wont to allege the excuſe of good *Breeding*. But if we could not ſtudy, or underſtand our own Country without the imputation of ill manners, good *Breeding* were the moſt pernicious thing in the World. For there was never yet any *Nation* great, which only admir'd the Cuſtoms of other people, and wholly made them the Pattern of their imitation. This wandring, and affected humor *Experiments* will leſſen, above all other *ſtudies*. They will employ our thoughts, about our Native conveniences: they will make us intend our minds, on what is contain'd within our own Seas: and by conſidering, and handling them more, will alſo make them more worthy of our conſideration.

The Third *imperfection* is on the other extream, and that is a *narrowneſs of mind*, and a *puſillanimous confining* our thoughts to our ſelves, without regarding any thing that is forein, or believing that any of their *Arts*, or *Cuſtoms* may be preferr'd before our own. This indeed is a perverſneſs, of which the *Engliſh* are not wholy to be acquitted: it being proper to *Iſlands*, and to ſuch *Countries* that are divided from the reſt of the *World*. This will be cur'd by the effectual *Demonſtrations* that the *Society* will give, of the benefit of a univerſal *Correſpondence*, and *Communication*. And this according to their Method, will be done without falling into the other vice of affecting

cting forein *habits*, and *manners*, and *geſtures*. In theſe the *Engliſh* need not be beholding to others: but in their Fruits, in their Manufactures, in their Engines, in their works in Gold, and Silver, and Braſs, and Iron, we may follow their practice, and emulate their Curioſities, without affectation.

There is one inſtance which will ſhew how our reſpect to outlandiſh things is to be regulated. To depend on the *French* for every litle faſhion of Cloaths, and to equal their *Nobility* in their way of life, is neither for our honor, nor profit. For the difference between their *Gentry* and ours, and their *Commonalty* and ours is ſo great; that the ſame manners will not be decent in us, which become them well enough. But to learn from them their *skill* in *Horſemanſhip*, and *Arms*, their *Building*, their *Cultivation of Fruits*, the *Parſimony*, and *Induſtry* of their *Tradeſmen*, is commendable: for in theſe things we are defective, and they excell. It is therefore the admiration of forein *extravagances*, and not the imitation of their *excellencies* that is to be condemn'd. If we will rather obſtinately be content with our own ſtore, than borrow what is good from abroad: we flatter our ſelves with the ſame fooliſh imaginations, that all *Countrys* had while they were barbarous. To them their *Acorns*, and their *Cottages* were at firſt the utmoſt ends of their ambition. They knew no more, nor aſpir'd to any farther addition: But as ſoon as a new light ſprung forth amongſt them, they deſpis'd themſelves and their former condition; and then they firſt began to underſtand their *wants*, when they perceiv'd how they might be ſupply'd. As long as we find, that all parts of our *Country*, are not Ingenious, Inventive, and Induſtrious alike: we cannot præſume, that we

have already got beyond all poſſibility of *amendment* by others patterns. As long as we behold any *Citty*, or *Province*, or *Family*, or *Street* of our Neighbors, exceed the worſt of ours, I will not ſay the beſt in eaſineſs of *life*, or pleaſantneſs, and ſmoothneſs of *manners*: we have no reaſon to arrogat too much to our ſelves; but we rather ſhould conceive it to be a leſs diſgrace to tread in their *footſteps*, than to want their perfections. As long as there remains any room for our moſt civil *People* to grow more *Civil*, the Introduction of Forein *Inventions* is not only *pardonable*, but *neceſſary*: For ſuch is the nature of *Civility*, that as it increaſes, it ſtill requires more *Arts*, though it contents itſelf with leſs Forms of living.

The Fourth miſchief by which the greatneſs of the *Engliſh* is ſuppreſs'd, is a want of union of *Intereſts*, and *Affections*. This is originally caus'd by a Natural reſervedneſs, to which our Temper is inclin'd: but it has bin heighten'd by our *Civil differences*, and *Religious diſtractions*. For the ſweetning of ſuch diſſentions, it is not beſt at firſt to meet, and converſ about affairs of ſtate, or ſpiritual controverſies. For thoſe did firſt occaſion our *animoſities*, and the more they are rubb'd, the rawer they will prove. But the moſt effectual remedy to be us'd is, firſt to aſſemble about ſome *calm*, and *indifferent* things, eſpecially *Experiments*. In them there can be no cauſe of mutual *Exaſperations*: In them they may agree, or diſſent without faction, or fierceneſs: and ſo from enduring each others *company*, they may riſe to a bearing of each others *opinions*; from thence to an exchange of good *Offices*; from thence to real *Friendſhip*: Till at laſt by ſuch a Gentle, and eaſy *Method*, our ſeveral *Intereſts*,

tereſts and *Sects* may come to ſuffer one another, with the ſame peaceableneſs as men of different *Trades* live one by another in the ſame *Street.*

Nor is it the leaſt commendation the *Royal Society* deſerves, that deſigning a union of mens *Hands* and *Reaſons*, it has proceeded ſo far in uniting their *Affections*: For there we behold an unuſual ſight to the *Engliſh Nation*, that men of diſagreeing parties, and ways of life, have forgotten to hate, and have met in the unanimous advancement of the ſame *Works*. There the *Soldier*, the *Tradeſman*, the *Merchant*, the *Scholar*, the *Gentleman*, the *Courtier*, the *Divine*, the *Presbyterian*, the *Papiſt*, the *Independent*, and thoſe of *Orthodox Judgment*, have laid aſide their names of diſtinction, and calmly conſpir'd in a mutual agreement of *labors* and *deſires*: A Bleſſing which ſeems even to have exceeded that Evangelical Promiſe, *That the Lion and the Lamb ſhall ly down together*: For here they do not only endure each others preſence without violence or fear; but they *work* and *think* in company, and confer their help to each others *Inventions.*

§ XXXIX. *Experimental Knowledge will not hinder Obedience.*

The laſt part of the *General Intereſt* of our *Nation*, in which I will ſurvey the influence of *Experiments*, is *Obedience to the Civil Government*: And we ought to be very watchful that they prove not offenſive to the *Supreme Power*: For ſeing the *King* has honor'd them with His *Royal Patronage*, it is but juſt that the *Prærogatives* of His *Crown* ſhould be no loſers by their increaſ. It is indeed a common accuſation, which is wont to be made againſt all manner of *Knowledge*, by thoſe who have it not, That it renders men mutinous, arrogant, and incapable of *Superiors*: But if this be

admitted, we ſhall aſperſ *human Nature* and *Government* with the greateſt calumny. This were to affirm, That men can not exerciſe their *Reaſon* without being *factious* and *unruly*; and that *Civil Government* will be inſupportable to all but ignorant men and fools: which is ſo far from being tru, that it were eaſie to prove that thoſe *Nations* which are void of all *Arts* and *Knowledge*, cannot be properly ſaid to pay a right *Obedience* to their *Soveraigns*; but that the ſubjection under which they live, rather deſerves to be ſtyl'd the ſtupidity and ſlavery of Beaſts, than a juſt and a manly ſubmiſſion.

But to limit this Queſtion to the particular kind of *Knowledge* which is now under debate, it is certain that the skill of *Nature* ought ſo little to be ſuſpected for making men perverſ and ungovernable, that it is the beſt præſervative againſt *diſobedience*. One of the principal Cauſes of this is a miſguided *Conſcience*, and oppoſing the pretended Dictates of *God* againſt the Commands of the *Sovereign*. This I have already ſhewn, that theſe *labors* will moderat and reform, by aboliſhing or reſtraining the fury of *Enthuſiaſm*. Another is idle poverty, which drives men into ſulleneſs, melancholy, diſcontent, and at laſt into reſiſtance of *lawful Authority*. To this *Experiments* will afford a certain cure; they will take away all pretence of idleneſs, by a conſtant courſ of pleaſant indeavors; they will employ men about profitable *Works*, as well as *delightful*; by the pleaſure of their *Diſcoveries* they will wear off the roughneſs, and ſweeten the humorous peeviſhneſs of mind, whereby many are ſowr'd into *Rebellion*.

But the moſt fruitful Parent of *Sedition* is *Pride*, and a lofty conceit of mens own *wiſdom*; whereby they

they preſently imagine themſelves ſufficient to direct and cenſure all the *actions* of their *Governors*. And here that is true in *Civil affairs*, which I have already quoted out of my Lord *Bacon* concerning *Divine*: A litle *Knowledge* is ſubject to make men headſtrong, inſolent, and untractable; but a great deal has a quite contrary effect, inclining them to be ſubmiſſive to their *Betters*, and obedient to the *Sovereign Power*.

The *Science* that is acquir'd by *Diſputation*, teaches men to cavil well, and to find fault with accurate ſubtilty; it gives them a fearleſs confidence of their own judgments; it leads them from contending in ſport, to oppoſitions in earneſt; it makes them believe that every thing is to be handled for, and againſt, in the *State*, as well as in the *Schools*. But the unfeign'd and laborious *Philoſophy* gives no countenance to the vain dotages of privat *Politicians*: that bends its *Diſciples* to regard the benefit of mankind, and not the diſquiet: that by the moderation it preſcribes to our thoughts about *Natural Things*, will alſo take away all ſharpneſs and violence about *Civil*: The *Work* of that is ſo vaſt, that it cannot be perform'd without the aſſiſtance of the *Prince*: It will not therefore undermine his *Authority* whoſe aid it implores: that preſcribes a better way to beſtow our time, than in contending about litle differences, in which both the Conquerors and the Conquer'd have always reaſon to repent of their ſucceſs: That ſhews us the difficulty of ord'ring the very motions of ſenſeleſs and irrational things; and therefore how much harder it is to rule the reſtleſs minds of men: That teaches men *humility*, and acquaints them with their own *errors*; and ſo removes all overweening haughtineſs of mind, and ſwelling imaginations, that they are better able

to

to manage Kingdoms than thoſe who poſſeſs them. This without queſtion is the chief root of all the uneaſineſs of *Subjects* to their *Princes*. The World would be better govern'd, if ſo many did not præſume that they are fit to ſuſtain the cares of *Government*. Tranſgreſſion of the *Law* is *Idolatry*: The *reaſon* of mens contemning all *Juriſdiction* and *Power*, proceeds from their Idolizing their own *Wit*: They make their own Prudence omnipotent; they ſuppoſe themſelves *infallible*; they ſet up their own *Opinions*, and worſhip them. But this vain *Idolatry* will inevitably fall before *Experimental Knowledge*; which as it is an *enemy* to all manner of falſ *ſuperſtitions*, ſo eſpecially to that of mens *adoring themſelves*, and *their own Fancies*.

Sect XL. *The Concluſion, being a general Recommendation of this Deſign.*

I have now at laſt brought my Reader, by a tedious compaſs, to the end of our Journey: And here I deſire him to look back, and to make a reflection on the matters of which I have treated. In the firſt part of my Diſcourſ I have alleg'd the Cauſes by which theſe *Studies* were ſuppreſs'd in all former *Ages*; which have bin Intereſt of *Sects*, the violence of *Diſputations*, the plauſible Arts of *Speech*, the *Religious Controverſies*, the *Dogmatical Opinions*, the *poverty* of the *Undertakers*, and the want of a continual race of *Experimenters*. In the Second I have ſhew'd by what ſteps the *Royal Society* aroſe, what it has propos'd to attempt, what courſ it has taken to make its *Obſervations* univerſal and perpetual; what aſſiſtance has bin afforded it to that purpoſe, and about what particulars it has bin converſant. In the Third I have try'd to free it from the falſe ſcandals of *Ignorance*, and the præjudices of ſeveral ways of life, and

to

to prove that its effects will more immediatly refer to our own Country.

My Reader now beholds an Aſſembly ſetled of many eminent men of all Qualities: who have ingag'd to beſtow their labors, on a deſign ſo public, and ſo free from all ſuſpicion of mean, or private Intereſt. What foundation they have within themſelves, for defraying the expence of their *Trials*, and *Intelligence*, may be gheſs'd by their *Number*, which at this preſent, amounts very neer to *Two Hundred*; as appears by this following *Catalogue*, which I have rang'd *Alphabetically*.

The *King*'s Majeſty *Founder*, and *Patron*.
His Royal Highneſs the *Duke* of *York*.
His Highneſs *Prince Rupert*.
His Highneſs *Ferdinand Albert*, *Duke* of *Brunſwick*, and *Lunenbourgh*.

The *Duke* of *Albermarle*, the *Earl* of *Alesbury*, the *Earl* of *Argill*, the *Lord Aſhley*, the *Lord Anneſley*, Mr *Aſhmole*, Sr. *Robert Atkins*, Mr. *Auſtin*, Monſ. *Auzout*, Mr. *Awbrey*.

The *Duke* of *Buckingham*, the Lord *George Berkeley*, the Lord *Brereton*, Mr. *Bagnal*, Mr. *Bains*, Mr. *William Balle*, Mr. *Iſaac Barrow*, Dr. *George Bate*, Dr. *Bathurſt*, Dr. *Beal*, Monſ. *Beaufort de Freſars*, Sr. *John Birkinhead*, Mr. *Blunt*, Mr. *Boyl*, Mr. *Brook*, Dr. *Bruce*, Monſ. *Bullialdus*, Mr. *Burnet*, Sr. *Edward Byſhe*.

The Lord *Arch-Biſhop* of *Canterbury*, the Earl of *Clarendon* Lord *Chancellor* of *England*, the Earl of *Carlile*, the Earl of *Craford*, and *Lindſay*, the Lord *Cavendiſh*, the Lord *Clifford*, Mr. *Carkeſs*, Mr. *Carteret*, Dr.

Dr. *Charleton*, Sr. *Winſtone Churchill*, Sr. *John Clayton*, Sr. *Clifford Clifton*, Mr. *George Cock*, Sr. *Richard Corbet*, Dr. *Cotton*, Dr. *Cox*, Mr. *Thomas Cox*, Mr. *Daniel Cox*, Mr. *Creed*, Mr *Criſpe*, Sr. *John Cutler*.

The Marqueſs of *Dorcheſter*, the Earl of *Devonſhire*, the Earl of *Dorſet*, Monſ. *Vital de Damas*, Sr. *George Ent*, Mr. *Elliſe*, Mr. *John Evelyn*, Sr. *Francis Fane*, Monſ. *le Febvre*, Sr. *John Finch*, Mr. *Henry Ford*, Sr. *Bernhard Gaſcoigne*, Mr. *Joſeph Glanvile*, Dr. *Gliſſon*, Mr *William Godolphin*, Mr. *Graunt*.

The *Lord Hatton*, Mr. *Haak*, Mr. *William Hammond*, Mr. *William Harrington*, Sr. *Edward Harley*, Sr. *Robert Harley*, Mr. *Harley*, Dr. *Henſhaw*, Monſ. *Hevelius*, Mr. *Abraham Hill*, Mr. *Hoar*, Dr. *Holder*, Mr. *Hook*, Mr. *Charles Howard*, Monſ. *Huygens*.

Mr. *Richard Jones*, the Earl of *Kincardin*, Sr. *Andrew King*, Mr. *Edmund King*, the Earl of *Lindſey*, the Lord *Biſhop* of *London*, Mr. *Lake*, Sr. *Ellis Leighton*, Mr. *James Long*, Sr. *John Lowther*, Mr. *Lowther*, Monſ. *Hugues de Lyonne*.

The Earl of *Mancheſter*, Monſ. *Nicolas Mercator*, Dr. *More*, Dr. *Jaſper Needham*, Dr. *Needham*, Mr. *Thomas Neile*, Mr. *William Neile*, Mr. *Nelthorp*, Mr. *Newburgh*, Sr. *Thomas Nott*, the Earl of *Peterburgh*, Mr. *Packer*, Mr. *Samuel Parker*, Sr. *Robert Paſton*, Dr. *John Pearſon*, Dr. *Pell*, Sr. *William Perſall*, Sr. *Peter Pett*, Mr. *Peter Pett*, Monſ. *Petit*, Sr. *William Portman*, Mr. *Francis Potter*, Mr. *Povey*, Dr. *Power*, Sr. *Richard Powle*, Mr. *Pepys*.

The Lord *Roberts* Lord *Privy Seal*, the Lord *Biſhop* of *Rocheſter*, Mr. *Rolt*, Mr. *Rycaut*, the Earl of *Sandwich*, the Lord *Viſcount Stafford*, the Lord *Stermont*, Mr. *Schroter*, Sr. *James Shaen*, Mr. *Skippon*, Sr. *Nicholas Slaney*, Mr. *Henry Slingsby*, Mr. *Smethwick*, Mr. *Edward*

Edward Smith, Dr. *George Smith*, Monſ. *Sorbiere*, Sr. *Robert Southwell*, Mr. *Alexander Stanhop*, Mr. *Thomas Stanley*.

The Earl of *Tweedale*, Sr. *Gilbert Talbot*, Sr. *John Talbot*, Dr. *Terne*, Mr. *Thomas Thyn*, Dr. *Thruſton*, Sr. *Samuel Tuke*, Sr. *Theodore de Vaux*, Mr. *Vermuyden*, Monſ. *Iſaac Voſſius*.

The Lord *Biſhop* of *Wincheſter*, Mr. *Waller*, Dr. *Wallis*, Mr. *Waterhouſe*, Dr. *Whiſtler*, Mr. *Joſeph Williamſon*, Dr. *Willis*, Mr. *Francis Willughby*, Mr. *Wind*, Mr. *Winthorp*, Mr. *Woodford*, Mr. *Matthew Wren*, Dr. *Thomas Wren*, Sr. *Cyril Wyche*, Sr. *Peter Wyche*, Mr. *Wylde*, the Lord *Arch-Biſhop* of *York*, the Lord *Teſter*.

The preſent *Council* are theſe that follow,

William Lord Viſcount *Brouncker* Preſident: which Office has bin annually renew'd to him by Election, out of the true judgment, which the *Society* has made of his great *Abilities* in all *Natural*, and eſpecially *Mathematical Knowledge*.

Mr. *William Aerskin*, Dr. *Peter Ball*, Dr. *Timothy Clerk*, Mr. *Daniel Colwall*, Dr. *Croon*, the Lord *Biſhop* of *Exeter*, Dr. *Jonathan Goddard*, Mr. *Henry Howard* of *Norfolk*, Mr. *Henſhaw*, Mr. *Hoskins*, Sr. *Robert Moray*, Sr. *Anthony Morgan*, Dr. *Merret*, the Earl of *Northampton*, Sr. *Paul Neile*, Mr. *Oldenburgh*, Sr. *William Petty*, Doctor *Pope*, Dr. *Wilkins*, Dr. *Chriſtopher Wren*.

In this number perhaps there may ſome be found, whoſe *employments* will not give them leave to promote theſe *Studies*, with their own *Hands*. But it being their part to *Contribute* joyntly towards the *Charge*, and to paſs *judgment* on what others ſhall *try*: they will appear to be well-nigh as uſeful, as

thoſe that *Labor*, to the main end of this *Enterprize*.

Whatever *Revenew* they ſhall raiſ, by this or any other means, they intend thereby to make an Eſtabliſhment for their *Curators*. To this Office they have already admitted ſome of their *Fellows*, whom they will employ according to their *Studies* and *Sufficience*: Some ſhall be ſent to travail abroad to ſearch for *Diſcoveries*: ſome ſhall conſtantly remain in *London*, and repreſent their *Obſervations* to the weekly *Aſſemblies*.

The places of their *Reſidence* they have appointed to be two: One a *College*, which they deſign to build in *London*, to ſerve for their *Meetings*, their *Laboratories*, their *Repoſitory*, their *Library*, and the Lodgings for their *Curators*: The other the *College* at *Chelſey*, which the *King* has beſtow'd on them; where they have a large Incloſure, to ſerve for all *Experiments* of *Gardning* and *Agriculture*: and by the neighbourhood of the *River* they have excellent opportunity of making all *Trials* that belong to the Water.

And now as I have ſpoken of a *Society* that prefers *Works* before *Words*, ſo it becomes their *Hiſtory* to endeavor after real *fruits* and *effects*. I will therefore conclude by recommending again this *Undertaking* to the *Engliſh Nation*; to the *braveſt People*, the moſt *generous Deſign*; to the moſt zealous lovers of *Liberty*, the ſureſt way to randſome the minds of all mankind from *Slavery*.

The Privileges that our *Kings* Dominions enjoy for this end, appear to be equal'd by no other *Country*. The men that we have now living to employ, are excellently furniſh'd with all manner of abilities: Their Method is already ſetled, and plac'd out of the reach of calumny or contradiction.

The

The work it ſelf indeed is vaſt, and almoſt incomprehenſible, when it is conſider'd in groſs: But they have made it feaſible and eaſie, by diſtributing the burden. They have ſhew'n to the World this great ſecret, That *Philoſophy* ought not only to be attended by a ſelect company of *refin'd Spirits*. As they deſire that its productions ſhould be *vulgar*, ſo they alſo declare, that they may be promoted by *vulgar hands*. They exact no extraordinary præparations of *Learning*: to have ſound *Senſes* and *Truth*, is with them a ſufficient Qualification. Here is enough buſineſs for *Minds* of all ſizes: And ſo boundleſs is the variety of theſe *Studies*, that here is alſo enough delight to recompence the Labors of them all, from the moſt ordinary capacities, to the higheſt and moſt ſearching *Wits*.

Here firſt they may take a plain view of all particular things, their kinds, their order, their figure, their place, their motion: And even this naked proſpect cannot but fill their thoughts with much ſatisfaction, ſeing it was the firſt pleaſure which the *Scripture* relates *God* himſelf to have taken at the *Creation*; and that not only once, but at the end of every days work, when he ſaw all that he had made, and approv'd it to be good. From this they may proceed to ſurvey the difference of their Compoſition, their Effects, the Inſtruments of their Beings and Lives, the Subtilty and Structure, the decay and ſupply of their parts; wherein how large is the ſpace of their delight, ſeing the very ſhape of a *Mite* and the ſting of a *Bee* appears ſo prodigious. From hence they may go to apply things together, to make them work one upon another, to imitate their productions, to help their defects, and with the Nobleſt duty to aſſiſt *Na-*

ture, our common mother, in her *Operations*: From hence to all the works of mens hands, the divers *Artifices* of ſeveral *Ages*, the various Materials, the Improvement of *Trades*, the advancement of *Manufactures*: In which laſt alone there is to be found ſo great content, that many Mighty Princes of the former and preſent Times, amidſt the pleaſures of *Government*; which are no doubt the higheſt in the World, have ſtriven to excel in ſome *Manual Art*.

In this ſpacious fie'd their *Obſervations* may wander, And in this whatever they ſhall meet with, they may call their own. Here they will not only injoy the cold contentment of *Learning*, but that which is far greater, of *Diſcovering*. Many things that have bin hitherto hidden, will ariſe and expoſe themſelves to their view: Many Methods of advancing what we have already, will come in their way: Nay, even many of the loſt *Rarities* of *Antiquity* will be hereby reſtor'd. Of theſe a great quantity has bin overwhelm'd in the ruines of *Time*: And they will ſooner be retreiv'd by our laboring anew, in the material Subjects whence they firſt aroſe, than by our plodding everlaſtingly on the ancient *Writings*. Their *Inventions* may be ſooneſt regain'd the ſame way by which their *Medals* and *Coins* have bin found; of which the greateſt part has bin recover'd, not by thoſe who ſought for them on purpoſe in old rubbiſh, but by digging up Foundations to raiſ new Buildings, and by plowing the Ground to ſow new Seed.

This is the *Work* we propoſe to be incorag'd, which at once regards the diſcovering of new *Secrets*, and the purifying and repairing all the profitable things of *Antiquity*. The Supply that is needful to finiſh it, will neither impoveriſh Families, nor exhauſt

hauſt a mighty income. So neer is Mankind to its happineſs, that ſo great an *Attempt* may be plentifully indow'd by a ſmall part of what is ſpent on any one ſingle Luſt, or extravagant Vanity of the Time. So moderat is the *Society* in their deſires of aſſiſtance, that as much Charity as is beſtow'd in *England* in one year, for the relief of particular Poverty and Diſeaſes, were enough for ever to ſuſtain a *Deſign*, which indeavors to give aid againſt all the infirmities and wants of *human Nature*.

If now this *Enterpriſe* ſhall chance to fail for want of *Patronage* and *Revenew*, the World will not only be fruſtrated of their preſent expectations, but will have juſt ground to deſpair of any future *Labors*, towards the increaſ of the *Practical Philoſophy*. If our *Poſterity* ſhall find, that an *Inſtitution* ſo vigorouſly begun, and ſo ſtrengthen'd by many ſignal advantages, could not ſupport itſelf: They will have reaſon in all times to conclude, That the long barreneſs of *Knowledge* was not caus'd by the corrupt method which was taken, but by the nature of the *Thing* itſelf. This will be the laſt great indeavor that will be made in this way, if this ſhall prove ineffectual: and ſo we ſhall not only be guilty of our own *Ignorance*, but of the *Errors* of all thoſe that come after us.

But if (as I rather believe and præſage) our *Nation* ſhall lay hold of this opportunity, to deſerve the applau'e of Mankind, the force of this *Example* will be irreſiſtibly prævalent in all *Countries* round about us; the State of *Chriſtendom* will ſoon obtain a new face; while this *Halcyon Knowledge* is breeding, all *Tempeſts* will ceaſe: the oppoſitions and contentious wranglings of *Science* falſly ſo call'd, will ſoon

vaniſh

vaniſh away: the peaceable calmneſs of mens *Judgments*, will have admirable influence on their *Manners*; the ſincerity of their *Underſtandings* will appear in their *Actions*; their *Opinions* will be leſs violent and dogmatical, but more certain; they will only be *Gods* one to another, and not *Wolves*; the value of their *Arts* will be eſteem'd by the *great things* they perform, and not by thoſe they ſpeak: While the old *Philoſophy* could only at the beſt pretend to the Portion of *Nepthali*, *to give goodly words*, the New will have the Bleſſings of *Joſeph* the younger and the belov'd Son; *It ſhall be like a fruitful Bough, even a fruitful Bough by a Well, whoſe Branches run over the wall: It ſhall have the bleſſings of Heven above, the bleſſings of the deep that lies under, the bleſſings of the breaſts and of the womb*: While the Old could only beſtow on us ſome barren Terms and Notions, the New ſhall impart to us the uſes of all the *Creatures*, and ſhall inrich us with all the Benefits of *Fruitfulneſs* and *Plenty*.

FINIS.

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ERRATA.

PAge 2. line 17. for *Buildings* read *Buildings.* p. 4. l. 32. for *Now, New.* p. 12. l. 26. for *ſtrongſter, ſtronger.* p. 27. l. 29. for *which, while.* p. 42. l. 32. for *Acamedy, Academy.* p. 75. l. 13. for *Invention, Intention.* p. 83. l. 8. after *there* put in *may.* p. 126. l. 27. for *Ducat, Ducal.* p. 154. l. 13. for *that, ſhall.* p. 156. for *axact, exact.* p. 242. l. 19. for *valies, values.* p. 313. l. 32. for *more, move.* p. 314. l. 20. for *Diamets, Diameters.* p. 327. l. 23. for *and, an.* p. 388. l. 16. for *the Eaſt, theſe.*

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